Microtest
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Test Report

Report No.:	MTi220914006-01E1
Date of issue:	2022-11-18
Applicant:	Xiamen Hanin Electronic Technology Co., Ltd.
Product:	Portable Label Printer, Portable Thermal Label Printer
Model(s):	HM-T3 Pro, HM-T300 Pro, iMOVE T3Pro, HM-T3 Pro-W, HM-T300 Pro-W, HM-T3 PRO, HM-T3P, T3 PRO, T3P, HM1800, HM1801, HM1802, HM1803, M1804, HM1805, MT1800, MT1801, MT1802, MT1803, MT1804, MT1805
FCC ID:	2AUTE-HMDL19001

Shenzhen Microtest Co., Ltd.

http://www.mtitest.com

Instructions

1. This test report shall not be partially reproduced without the written consent of the laboratory.

2. The test results in this test report are only responsible for the samples submitted

3. This test report is invalid without the seal and signature of the laboratory.

4. This test report is invalid if transferred, altered, or tampered with in any form without authorization.

5. Any objection to this test report shall be submitted to the laboratory within 15 days from the date of receipt of the report.

Contents

Test Result Certification	
Applicant:	**Xiamen Hanin Electronic Technology Co., Ltd.**
Address:	Room 305A, Angye Building, Pioneering Park, Torch High-tech Zone, Xiamen
Manufacturer:	**Xiamen Hanin Electronic Technology Co., Ltd.**
Address:	Room 305A, Angye Building, Pioneering Park, Torch High-tech Zone, Xiamen
Factory:	**Xiamen Hanin Electronic Technology Co., Ltd.**
Address:	No.96, Rongyuan Road, Tong'an District, Xiamen
Product description	
Product name:	Portable Label Printer, Portable Thermal Label Printer
Trademark:	HPRT, iDPRT
Model name:	HM-T3 Pro
Serial Model:	HM-T300 Pro, iMOVE T3Pro, HM-T3 Pro-W, HM-T300 Pro-W, HM-T3 PRO, HM-T3P, T3 PRO, T3P, HM1800, HM1801, HM1802, HM1803, M1804, HM1805, MT1800, MT1801, MT1802, MT1803, MT1804, MT1805
Date of Test	
Date of test:	2022-08-11 ~ 2022-11-02
Test result:	Pass

Test Engineer : Eugene Qiu

(Eugene Qiu)

Reviewed By: : Leon Chen

(Leon Chen)

Approved By: : Tom Xue

(Tom Xue)

1 Statement of Compliance

Maximum Reported SAR (W/kg @1g)				
Type	Test setting	WiFi	Bluetooth	Simultaneous TX
Body	Dist.= 0mm	0.486	0.042	0.528

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

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: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
248227 D01 802 11 Wi-Fi SAR v02r02: SAR Measurement Proceduresfor802.11 a/b/g Transmitters

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

3 General Description

3.1 Description of the EUT

Name of EUT:	Portable Label Printer, Portable Thermal Label Printer
Trade Mark:	HPRT, iDPRT
Model No.:	HM-T3 Pro
Listed Model(s):	HM-T300 Pro, iMOVE T3Pro, HM-T3 Pro-W, HM-T300 Pro-W, HM-T3 PRO, HM-T3P, T3 PRO, T3P, HM1800, HM1801, HM1802, HM1803, M1804, HM1805, MT1800, MT1801, MT1802, MT1803, MT1804, MT1805
Power supply:	Input: DC 5V/1A Battery: DC 7.4V 1800mAh
Hardware version:	HM-T300PROMB
Software version:	HM-T300PRO_V
Device Dimension:	Length x Width x Thickness(mm): 150x120x60
Device Category:	Portable
Product stage:	Production unit
RF Exposure Environment:	General Population/Uncontrolled

RF Specification Description

Wi-Fi 2.4G				
Support type:	☒ 802.11b	☒ 802.11g	☒ 802.11n	☐ 802.11ax
Support bandwidth:	☒ 20MHz	☐ 40MHz		
Note: *This device 2.4GHz Wi-Fi does not support hotspot operation*				
Bluetooth				
Support type:	☒ BR	☒ EDR	☒ BLE-1Mbps	☐ BLE-2Mbps
Note: *This device does not support Bluetooth Tethering.*				

3.2 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 ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528 is not required in SAR reports submitted for equipment approval.

Therefore, the measurement uncertainty is not required..

4 Test Facilities and Accreditations

4.1 Test laboratory

Test laboratory:	Shenzhen Microtest Co., Ltd.
Test site location:	101, No. 7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Telephone:	(86-755)88850135
Fax:	(86-755)88850136
CNAS Registration No.:	CNAS L5868
FCC Registration No.:	448573

5 Equipment List

No.	Equipment	Manufacturer	Model	Serial No.	Cal. date	Cal. Due
MTi-H001	Data Acquisition Electronics (DAE)	SPEAG	DAE4	646	2022/6/9	2023/6/8
MTi-H002	Isotropic E-Field Probe	SPEAG	EX3DV4	3166	2022/6/30	2023/6/29
MTi-H003	Dipole Antenna	SPEAG	D2450V2	874	2022/6/13	2023/6/12
MTi-H004	Network analyzer	Keysight	E5071C	MY46736354	2022/7/28	2023/7/27
MTi-H005	Dielectric Assessment System Kit	SPEAG	DAK-3.5	/	/	/
MTi-H006	Digital Thermometer	LI HUA JIN	DT-1310	80227826	2022/8/4	2023/8/3
MTi-H007	Thermometer Clock Humidity Monitor	MU BO SHI	MBS-323	/	2022/8/4	2023/8/3
MTi-E089	Signal Generator	Agilent	N5182A	MY49060455	2022/5/5	2023/5/4
MTi-E066	Signal Analyzer	Agilent	N9020A	MY50143483	2022/5/5	2023/5/4
MTi-E063	Directional Coupler	/	PD-4SF-206D	/	2022/5/5	2023/5/4

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

6 SAR MEASUREMENTS SYSTEM CONFIGURATION

6.1 SAR Measurement Set-up

The DASY4 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 DASY4 measurement server.

The DASY4 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.

DASY4 software and SEMCAD data evaluation software.

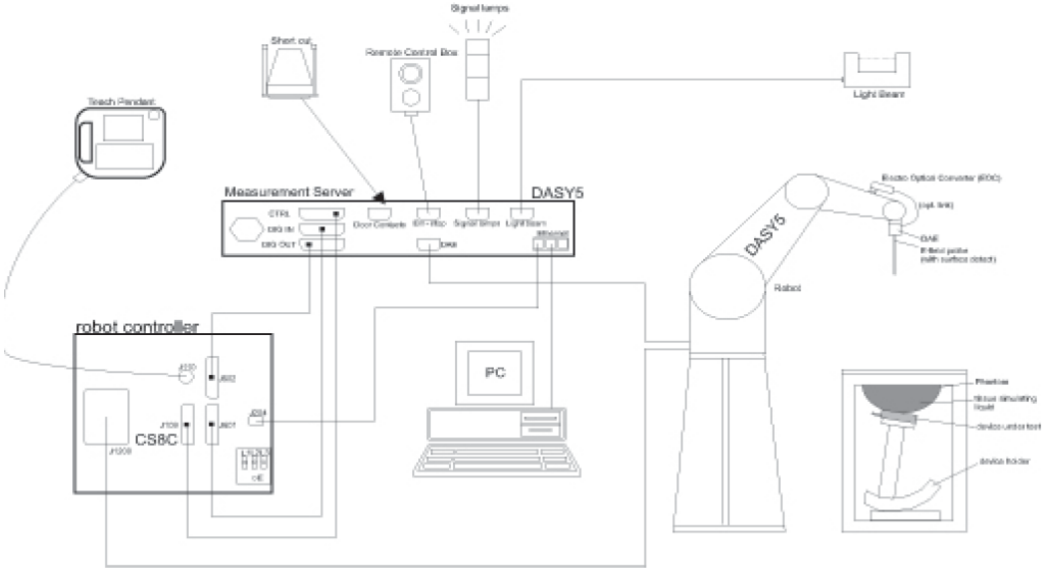
Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.

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.


Signal lamps
Short cut
Remote Control Box
Light Beam
Teach Pendant
Measurement Server
DASY5
Door Contacts
Signal lamps
Light Beam
DAE
robot controller
CS8C
PC
DASY5
Robot
Phantom
device under test
device holder


DASY4
speag

6.2 DASY4 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.

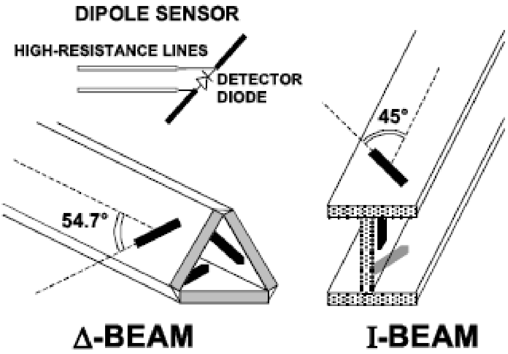
- **Probe Specification**

Construction	Symmetrical design with triangular core 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 10 GHz)
Directivity	± 0.1 dB in TSL (rotation around probe axis) ± 0.3 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g - > 100 mW/g Linearity: ±0.2 dB (noise: typically <1 µW/g)
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better than 30%.
Compatibility	DASY3, DASY4, 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

The phantom used for all tests i.e. for both system checks and device testing, was the twin-headed "SAM Phantom", manufactured by SPEAG. The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region, where shell thickness increases to 6mm).
System checking was performed using the flat section, whilst Head SAR tests used the left and right head profile sections. Body SAR testing also used the flat section between the head profiles.

SAM Twin Phantom

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 Parameters extracted from EN 62209-1

Parameter	DUT transmit frequency being tested	
	$f \leq 3$ GHz	3 GHz $< f \leq 6$ GHz
Maximum distance between the measured points (geometric centre of the sensors) and the inner phantom surface (z_{M1} in Figure 6 in mm)	5 ± 1	δ ln(2)/2 ± 0,5 [a]
Maximum spacing between adjacent measured points (see 7.2.10.3.1, in mm) [b]	20 or half of the corresponding zoom scan length, whichever is smaller	60/f or half of the corresponding zoom scan length, whichever is smaller
Maximum angle between the probe axis and the phantom surface normal (α in Figure 6) [c]	30°	20°
Tolerance in the probe angle	1°	1°

[a] δ is the penetration depth for a plane-wave incident normally on a planar half-space.

[b] See 7.2.10 on how Δx and Δy may be selected for individual area scan requirements.

[c] The probe angle with respect to the phantom surface normal is restricted due to the degradation in the measurement accuracy in fields with steep spatial gradients. The measurement accuracy decreases with increasing probe angle and increasing frequency. This is the reason for the tighter probe angle restriction at frequencies above 3 GHz.

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 Parameters extracted from EN 62209-1

Parameter	DUT transmit frequency being tested	
	$f \leq 3$ GHz	3 GHz $< f \leq 6$ GHz
Maximum distance between the closest measured points and the phantom surface (z_{M1} in Figure 6 and Table 1, in mm)	5	$\delta \ln(2)/2$ [a]
Maximum angle between the probe axis and the phantom surface normal (α in Figure 6)	30°	20°
Maximum spacing between measured points in the x- and y-directions (7.2.10.3.2, in mm)	8	$24/f$ [b]
For uniform grids: Maximum spacing between measured points in the direction normal to the phantom shell (Δz_1 in Figure 6, in mm)	5	$8 - f$
For graded grids: Maximum spacing between the two closest measured points in the direction normal to the phantom shell (Δz_1 in Figure 6, in mm)	4	$12/f$
For graded grids: Maximum incremental increase in the spacing between measured points in the direction normal to the phantom shell ($R_z = \Delta z_2/\Delta z_1$ in Figure 6)	1,5	1,5
Minimum edge length of the zoom scan volume in the x- and y-directions (L_z in 7.2.10.3.2, in mm)	30	22
Minimum edge length of the zoom scan volume in the direction normal to the phantom shell (L_h in 7.2.10.3.2, in mm)	30	22
Tolerance in the probe angle	1°	1°

[a] δ is the penetration depth for a plane-wave incident normally on a planar half-space.

[b] This is the maximum spacing allowed, which may not work for all circumstances.

Zoom Scan Parameters extracted from EN 62209-2

Parameter	DUT transmit frequency being tested	
	$f \le 3$ GHz	3 GHz < $f \le 6$ GHz
Maximum distance between the closest measured points and the phantom surface (z_{M1} in Figure 14 and Table 2, in mm)	5	δ ln(2)/2 [a]
Maximum angle between the probe axis and the flat phantom surface normal (α in Figure 14)	5°	5°
Maximum spacing between measured points in the x- and y-directions (Δx and Δy, in mm)	8	24/f [b,c]
For uniform grids: Maximum spacing between measured points in the direction normal to the phantom shell (Δz_1 in Figure 14, in mm)	5	10/(f − 1)
For graded grids: Maximum spacing between the two closest measured points in the direction normal to the phantom shell (Δz_1 in Figure 14, in mm)	4	12/f
For graded grids: Maximum incremental increase in the spacing between measured points in the direction normal to the phantom shell ($R_z = \Delta z_2/\Delta z_1$ in Figure 14)	1,5	1,5
Minimum edge length of the zoom scan volume in the x- and y-directions (L_z in 7.2.5.3, in mm)	30	22
Minimum edge length of the zoom scan volume in the direction normal to the phantom shell (L_h in 7.2.5.3, in mm)	30	22
Tolerance in the probe angle	1°	1°

[a] δ is the penetration depth for a plane-wave incident normally on a planar half-space.

[b] This is the maximum spacing allowed, which may not work for all circumstances.

[c] f is the frequency in 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 ± 5%.

7.2 Data Storage and Evaluation

Data Storage

The DASY4 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files 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 DASY4 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)

dcpi: diode compression point (DASY parameter)

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

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

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

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 DIELECTRIC PROPERTY MEASUREMENTS & SYSTEM CHECK

8.1 Tissue Dielectric Parameters

The temperature of the tissue-equivalent medium used during measurement must also be within 18℃ to 25℃ and within ± 2℃ 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 ± 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 ± 10%. This is limited to frequencies ≤ 3 GHz.

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Tissue dielectric parameters for Head and Body				
Target Frequency (MHz)	Head		Body	
	ε_r	σ(S/m)	ε_r	σ(S/m)
2450	39.2	1.80	52.7	1.95

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

Measurement Results:

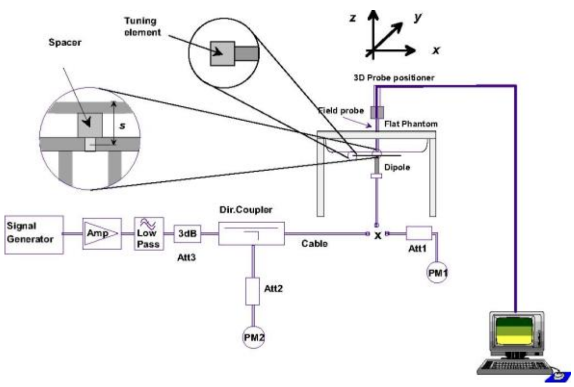
Dielectric performance of Head tissue simulating liquid									
Frequency (MHz)	ε_r		σ(S/m)		Delta (ε_r)	Delta (σ)	Limit	Temp (℃)	Date
	Target	Measured	Target	Measured					
2450	39.20	38.00	1.800	1.830	-3.06%	1.67%	±5%	22.1	2022/10/27

8.2 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

Measurement Results:

Body											
Frequency (MHz)	1g SAR			10g SAR			Delta (1g)	Delta (10g)	Limit	Temp (℃)	Date
	Target 1W	Normalize to 1W	Measured 20mW	Target 1W	Normalize to 1W	Measured 20mW					
2450	52.00	47.70	0.954	23.90	22.50	0.450	-8.27%	-5.86%	±10%	22.2	2022/10/27

Note:

The 1-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.

Test Laboratory: Microtest Date: 2022-10-27

SystemPerformanceCheck-D2450

DUT: Dipole 2450 MHz

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1

Medium: H2450 Medium parameters used: f = 2450 MHz; σ = 1.83 mho/m; ε_r = 38; ρ = 1000 kg/m³

Ambient Temperature：22.2℃; Liquid Temperature：21.1℃

DASY4 Configuration:

- Probe: ES3DV3 - SN3166; ConvF(4.73, 4.73, 4.73); Calibrated: 2022-6-27
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn646; Calibrated: 2022-6-6
- Phantom: TP-1918; Type: SAM; Serial: 1918
- ; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=10mW/Area Scan (6x7x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.545 mW/g

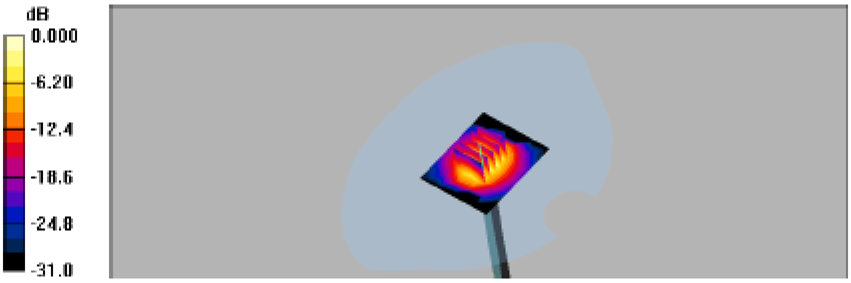
d=10mm, Pin=10mW/Zoom Scan (7x7x7) (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 20.3 V/m; Power Drift = -0.119 dB

Peak SAR (extrapolated) = 2.35 W/kg

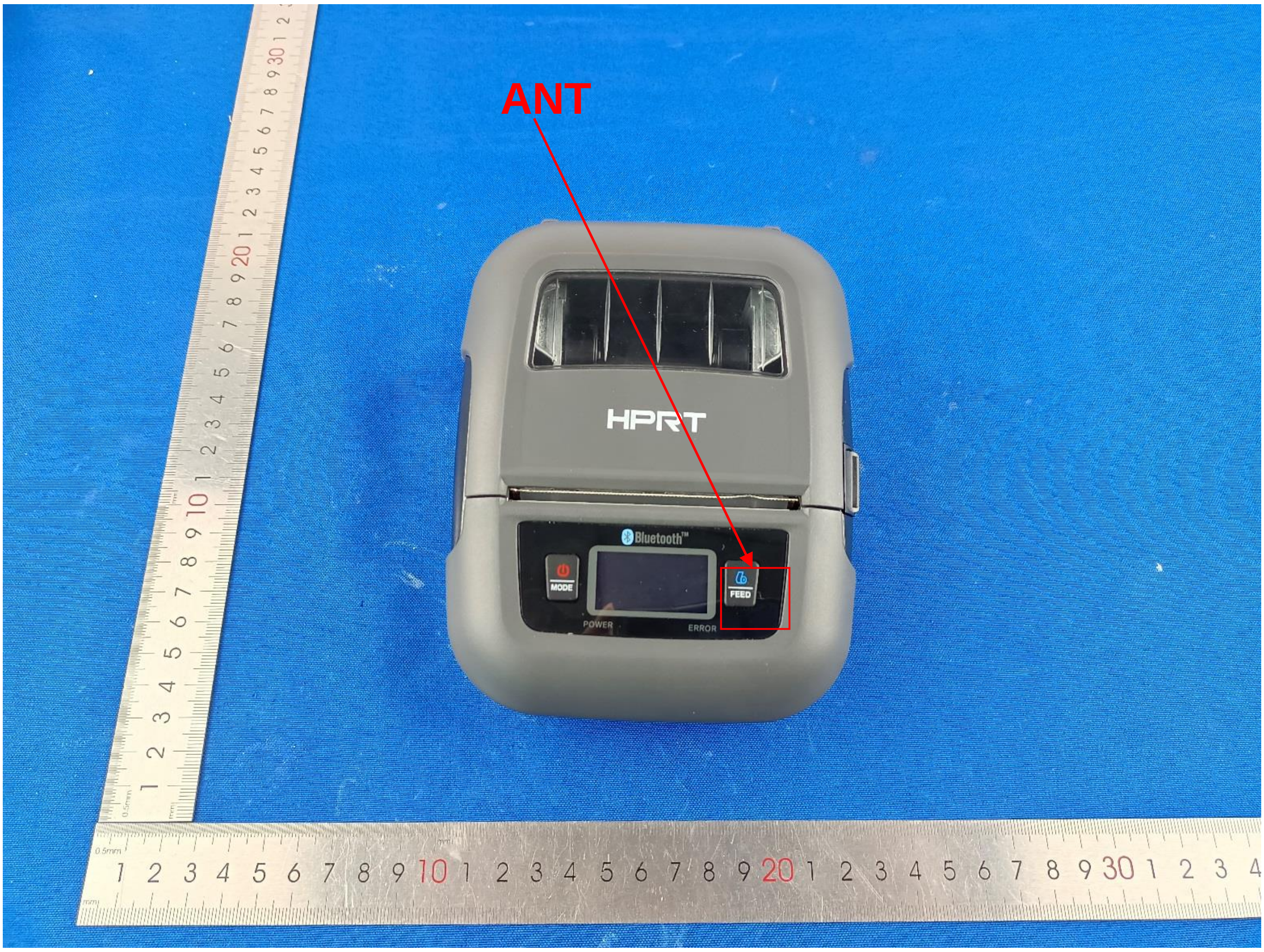
SAR(1 g) = 0.954 mW/g; SAR(10 g) = 0.450mW/g

Maximum value of SAR (measured) = 1.428 mW/g



0 dB = 1.428mW/g

9 ANT LOCATION



Per KDB 447498 D01, the 1-g and 10-g SAR test exclusion thresholds for 100MHz to 6GHz at test separation distances ≦50mm are determined by:

[(max. Power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] * [√f(GHz)] ≦3.0 for 1-g SAR

Band/Mode	F(GHz)	Position	Separation Distance (mm)	Exclusion Thresholds	Estimated SAR
Bluetooth	2.450	Head	0	0.3	0.042

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

The test exclusion thereshold is≦3, SAR testing is not required.

10 TEST DATA

Conduct power and Tune-up

Bluetooth					
Mode		Channel	Frequency (MHz)	Average Power (dBm)	Tune-up limit (dBm)
EDR	GFSK	0	2402	-5.56	-5.50
		39	2441	-3.54	-3.50
		78	2480	-0.98	-0.50
	π/4QPSK	0	2402	-5.69	-5.50
		39	2441	-2.59	-2.50
		78	2480	**-0.19**	0.00
	8DPSK	0	2402	-4.98	-4.50
		39	2441	-2.46	-2.00
		78	2480	-0.69	-0.50
BLE 1Mbps	GFSK	0	2402	-5.57	-5.50
		19	2440	-2.87	-2.50
		39	2480	-0.89	-0.50

WIFI 2.4G				
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up limit (dBm)
802.11b	1	2412	15.12	15.50
	6	2437	14.48	14.50
	11	2462	15.24	15.50
802.11g	1	2412	15.33	15.50
	6	2437	14.78	15.00
	11	2462	14.69	15.00
802.11n (HT20)	1	2412	15.10	15.50
	6	2437	14.67	15.00
	11	2462	14.41	14.50

SAR test value

WIFI 2.4G												
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune-up limit (dBm)	Tune-up scaling factor	Duty Cycle	Duty Cycle Scaling Factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Plot No.
		CH	MHz									
802.11b	Rear	1	2412	15.12	15.50	1.091	100.00%	1.000	-	-	-	-
		6	2437	14.48	14.50	1.005	100.00%	1.000	-	-	-	-
		11	2462	15.24	15.50	1.062	99.76%	1.002	0.090	0.457	0.486	1
	Front	1	2412	15.12	15.50	1.091	100.00%	1.000	-	-	-	-
		6	2437	14.48	14.50	1.005	100.00%	1.000	-	-	-	-
		11	2462	15.24	15.50	1.062	99.76%	1.002	0.112	＜0.01	-	-
	Left	1	2412	15.12	15.50	1.091	100.00%	1.000	-	-	-	-
		6	2437	14.48	14.50	1.005	100.00%	1.000	-	-	-	-
		11	2462	15.24	15.50	1.062	99.76%	1.002	-0.087	＜0.01	-	-
	Right	1	2412	15.12	15.50	1.091	100.00%	1.000	-	-	-	-
		6	2437	14.48	14.50	1.005	100.00%	1.000	-	-	-	-
		11	2462	15.24	15.50	1.062	99.76%	1.002	-0.125	0.251	0.267	-
	Top	1	2412	15.12	15.50	1.091	100.00%	1.000	-	-	-	-
		6	2437	14.48	14.50	1.005	100.00%	1.000	-	-	-	-
		11	2462	15.24	15.50	1.062	99.76%	1.002	0.012	＜0.01	-	-
	Bottom	1	2412	15.12	15.50	1.091	100.00%	1.000	-	-	-	-
		6	2437	14.48	14.50	1.005	100.00%	1.000	-	-	-	-
		11	2462	15.24	15.50	1.062	99.76%	1.002	0.129	＜0.01	-	-

The highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS,
802.11b power(mW)/ 802.11g power(mW)= 802.11b Report SAR/ 802.11g Report SAR
802.11g Report SAR=0.496W/kg＜1.2W/kg, so test 802.11g mode not require

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 D04 Interim General RF Exposure Guidance v01:
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 648474 D04 Handset SAR:
With headset attached, when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.
Additional 1-g SAR testing at 5 mm is not required when hotspot mode 10-g extremity SAR is not required for the surfaces and edges; since all 1-g reported SAR < 1.2 W/kg.

SAR test plot

Test Laboratory: Microtest Date/Time: 2022-10-27

wifi 2462 11b fcc

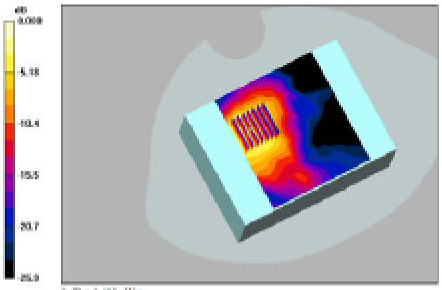
DUT: Tablet

Communication System: WIFI ; Frequency: 2462 MHz;Duty Cycle: 1:1.00241
Medium: H2450 Medium parameters used: f = 2462 MHz; σ = 1.84 mho/m; ε_r = 38; ρ = 1000 kg/m³
Ambient Temperature：22.1℃; Liquid Temperature：21.3℃

DASY4 Configuration:
- Probe: ES3DV3 - SN3166; ConvF(4.73, 4.73, 4.73); Calibrated: 2022-6-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn646; Calibrated: 2022-6-6
- Phantom: TP-1918; Type: SAM; Serial: 1918
- ; Postprocessing SW: SEMCAD, V1.8 Build 186

Unnamed procedure/Area Scan (10x9x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.460 mW/g

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.13 V/m; Power Drift = 0.09dB
Peak SAR (extrapolated) = 1.07 W/kg
SAR(1 g) = 0.457 mW/g; SAR(10 g) = 0.234 mW/g
Maximum value of SAR (measured) = 0.482 mW/g



0 dB = 0.482mW/g

11 SAR MEASUREMENT VARIABILITY

In accordance with published RF Exposure KDB 865664 D01 SAR measurement 100 MHz to 6 GHz. These
additional measurements are repeated after the completion of all measurements requiring the same head or
body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions
(normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the
repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is <0.8 or 2 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.8 or 2 W/kg (1-g or 10-g respectively), repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 or 3.6 W/kg (~ 10% from the 1-g or 10-g respective SAR limit).

Perform a third repeated measurement only if the original, first, or second repeated measurement is ≥ 1.5 or 3.75 W/kg (1-g or 10-g respectively) and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Band	Test Position	Frequency		Highest Measured SAR (W/kg)	First Repeated		Second Repeated	
		CH	MHz		Measured SAR(W/kg)	Largest to Smallest SAR Ratio	Measured SAR(W/kg)	Largest to Smallest SAR Ratio
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

12 SIMULTANEOUS TRANSMISSION ANALYSIS

No.	Simultaneous Transmission Configurations	Body	Note
1	WLAN (data) + Bluetooth (data)	Yes	

General note:

1. *The reported SAR summation is calculated based on the same configuration and test position*

Simultaneous Transmission data:

WIFI+ BT				
WLAN Band	Exposure Position	Max SAR (W/kg)		Summed SAR (W/kg)
		WIFI	BT	
WIFI 2.4G	Rear	0.486	0.042	**0.528**
	Front	＜0.01	0.042	＜0.043
	Left side	＜0.01	0.042	＜0.043
	Right side	0.267	0.042	0.309
	Top side	＜0.01	0.042	＜0.043
	Bottom side	＜0.01	0.042	＜0.043

Photographs of the Test Setup

See the Appendix – Test Setup Photos.

Photographs of the EUT

See the Appendix - EUT Photos.

----End of Report----