



# FCC SAR TEST REPORT

**Report No. :** SET2020-06692

**Product :** Thermal Imaging monocular

**Trade Name:** ZEISS

**Model No. :** DTI 3/35

**FCC ID :** 2AMSPDTI335

**IC :** 22938-DTI335

**Applicant :** Carl Zeiss AG

**Address :** Carl-Zeiss-Str. 22 73447 Oberkochen, Germany

**Issued by :** CCIC Southern Testing Co., Ltd.

**Lab Location :** Electronic Testing Building, No. 43 Shahe Road, Xili Street,  
Nanshan District, Shenzhen, Guangdong, China.


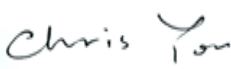

**Tel :** 86 755 26627338      **Fax:** 86 755 26627238

**Mail :** manager@ccic-set.com      **Website:** <http://www.ccic-set.com>

This test report consists of 24 pages in total. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product endorsement by CCIC-SET. The test results in the report only apply to the tested sample. The test report shall be invalid without all the signatures of testing engineers, reviewer and approver. Any objections must be raised to CCIC-SET within 15 days since the date when the report is received. It will not be taken into consideration beyond this limit.



## Test Report

**Product. ....:** Thermal Imaging monocular  
**Model No. ....:** DTI 3/35  
**Brand Name.....:** ZEISS  
**FCC ID.....:** 2AMSPDTI335  
**IC.....:** 22938-DTI335  
**Applicant.....:** Carl Zeiss AG  
**Applicant Address.....:** Carl-Zeiss-Str. 22 73447 Oberkochen, Germany  
**Manufacturer.....:** Carl Zeiss AG  
**Manufacturer Address:** Carl-Zeiss-Str. 22 73447 Oberkochen, Germany  
**Test Standards.....:** **47CFR §2.1093-** Radiofrequency Radiation Exposure Evaluation: Portable Devices;  
**ANSI C95.1-1992:** Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.( IEEE Std C95.1-1991)  
**RSS-102 Issue 5:** Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)(Issue 5 of March 2015)  
**IEEE 1528-2013:** IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques  
**IEC 62209-2:2010,** Human exposure to radio frequency fields from hand-held and body mounted wireless communication devices-Human models, instrumentation, and procedures -Part2:Procedure to determine the specific rate(SAR) for wireless communication devices used in close proximity to the human body(frequency range of 30MHz to 6GHz)  
**Test Result.....:** Pass  
**Test Date.....:** 2020.06.20-2020.06.20  
**Tested by .....**  2020-06-28  
\_\_\_\_\_  
Mei Chun, Test Engineer  
**Reviewed by.....:**  2020-06-28  
\_\_\_\_\_  
Chris You, Senior Engineer  
**Approved by.....:**  2020-06-28  
\_\_\_\_\_  
Shuangwen Zhang, Manager



## Contents

Test Report .....	2
<b>1. Administrative Data.....</b>	<b>4</b>
<b>2. Equipment Under Test (EUT) .....</b>	<b>5</b>
<b>3. Specific Absorption Rate (SAR) .....</b>	<b>6</b>
<b>4. Tissue check and recommend Dielectric Parameters .....</b>	<b>10</b>
<b>5. SAR measurement procedure .....</b>	<b>15</b>
<b>6. Conducted RF Output Power .....</b>	<b>16</b>
<b>7. Scaling Factor calculation .....</b>	<b>17</b>
<b>8. Test Results .....</b>	<b>18</b>
<b>9. Measurement Uncertainty.....</b>	<b>19</b>
<b>10. Equipment List.....</b>	<b>23</b>
ANNEX A: Appendix A: SAR System performance Check Plots.....	24
ANNEX B: Appendix B: SAR Measurement results Plots.....	24
ANNEX C: Appendix C: Calibration reports .....	24
ANNEX D: Appendix D: SAR Test Setup.....	24

## 1. Administrative Data

### 1.1 Testing Laboratory

**Test Site:** CCIC Southern Testing Co., Ltd.

**Address:** Electronic Testing Building, No. 43 Shahe Road, Xili Street, Nanshan District, Shenzhen, Guangdong, China

**CNAS Lab Code:** CCIC-SET is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659.

**NVLAP Lab Code:** CCIC-SET is a third party testing organization accredited by NVLAP according to ISO/IEC 17025. The accreditation certificate number is 201008-0.

**FCC Registration:** CCIC Southern Testing Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Designation Number: CN5031, valid time is until December 31, 2020.

**ISED Registration:** CCIC Southern Testing Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A-1 on Aug. 04, 2016, valid time is until December 31, 2020.

**Test Environment** Temperature (°C): 21°C

**Condition:** Relative Humidity (%): 60%

Atmospheric Pressure (kPa): 86KPa-106KPa

## 2. Equipment Under Test (EUT)

### Identification of the Equipment under Test

**Device Type:** Portable

**Exposure Category:** Population/Uncontrolled

**Sample Name:** Thermal Imaging monocular

**Brand Name:** ZEISS

**Model Name:** DTI 3/35

	Support Band	WIFI 2.4G
	Test Band	WIFI 2.4G
	Development Stage	Identical Prototype
	Accessories	Power Supply
<b>General description:</b>	Antenna type	Internal Antenna
	Modulation mode	WIFI(OFDM/DSSS)
	Hardware Version	V1.0
	Software Version	01040204150108
	Battery options :	Model:V1.0 Capacitance:4400mAh Charge Limit:4.2V
	Max. SAR Value	Body: 0.178 W/Kg(Limit:1.6W/Kg, 5mm distance)

### NOTE:

- The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

### SAR Summary

#### Highest Standalone SAR Summary

Exposure Position	Frequency Band	Scaled 1g-SAR(W/kg)	Highest Scaled 1g-SAR(W/kg)
Body-Support (5mm Gap)	2.4G WIFI	0.178	0.178

### 3. Specific Absorption Rate (SAR)

#### 4.1 Introduction

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

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

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

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

SAR measurement can be either related to the temperature elevation in tissue by

$$\text{SAR} = C \frac{\delta T}{\delta t}$$

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

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

where  $\sigma$  is the conductivity of the tissue,  $\rho$  is the mass density of the tissue and E is the rms electrical field strength.

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

## 4.2 Applicable Standards and Limits

### 4.2.1 Applicable Standards

47CFR §2.1093	Radiofrequency Radiation Exposure Evaluation: Portable Devices
ANSI C95.1-1992	Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.( IEEE Std C95.1-1991)
IEEE 1528-2013	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
IEC62209-2:2010	Human exposure to radio frequency fields from hand-held and body mounted wireless communication devices-Human models, instrumentation, and procedures -Part2:Procedure to determine the specific rate(SAR) for wireless communication devices used in close proximity to the human body(frequency range of 30MHz to 6GHz)
KDB 248227 D01	v02r02 802.11 Wi-Fi SAR
KDB 447498 D01	v06 General RF Exposure Guidance

### 4.2.2 RF exposure Limits

Human Exposure	Uncontrolled Environment General Population
<b>Spatial Peak SAR*</b> (Brain/Body)	<b>1.60 mW/g</b>
<b>Spatial Average SAR**</b> (Whole Body)	0.08 mW/g
<b>Spatial Peak SAR***</b> (Limbs)	4.00 mW/g

The limit applied in this test report is shown in bold letters.

Notes:

\* The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time

\*\* The Spatial Average value of the SAR averaged over the whole body.

\*\*\* The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

### 4.3 Phantoms

The phantom used for all tests i.e. for both system checks and device testing, was the twin-headed "SAM Phantom", manufactured by SATIMO. 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.

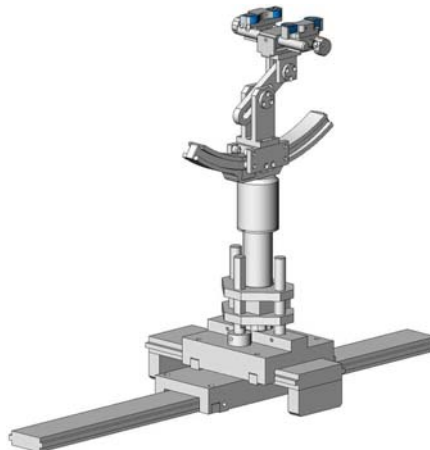


SAM Twin Phantom

### 4.4 Device Holder

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

The 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



## 4.5 Probe Specification

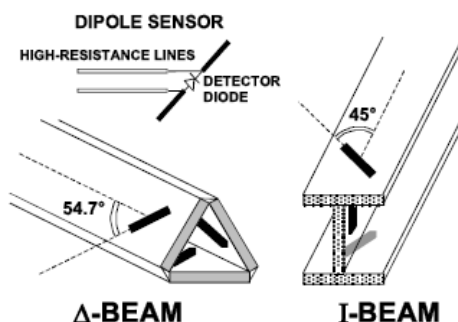


Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	700 MHz to 3 GHz; Linearity: $\pm 0.5$ dB (700 MHz to 3 GHz)
Directivity	$\pm 0.25$ dB in HSL (rotation around probe axis) $\pm 0.5$ dB in tissue material (rotation normal to probe axis)
Dynamic Range	$1.5 \mu\text{W/g}$ to $100 \text{ mW/g}$ ; Linearity: $\pm 0.5$ dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 5 mm Distance from probe tip to dipole centers: $<2.7$ mm
Application	General dosimetry up to 3 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones
Compatibility	COMOSAR

### 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:



## 4. Tissue check and recommend Dielectric Parameters

### 5.1 Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness Power drifts in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

Table 1: Recommended Dielectric Performance of Tissue

Ingredients (% by weight )	Frequency (MHz)											
	450		835		915		1900		2450		2600	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.46	52.4	41.05	56.0	54.9	40.4	62.7	73.2	55.24	64.49
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04	0.5	0.024
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0	0.0	0.0
Triton x-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0	44.45	32.25
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.2	52.5	39.0	52.5
Conductivity (s/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.80	1.78	1.96	2.16

MSL/HSL750 (Body and Head liquid for 650 – 850 MHz)

Item	Head Tissue Simulation Liquid HSL750 Muscle(body)Tissue Simulation Liquid MSL750			
H2O	Water, 35 – 58%			
Sucrose	Sugar, white, refined, 40-60%			
NaCl	Sodium Chloride, 0-6%			
Hydroxyethyl-cellulose	Medium Viscosity (CAS# 9004-62-0), <0.3%			
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyl-3(2H)-isothiazolone, 0.1-0.7%			
Frequency (MHz)	Head $\epsilon_r$		Body $\epsilon_r$	
750	41.9		55.2	
	Head $\sigma$ (S/m)		Body $\sigma$ (S/m)	
	0.89		0.97	

Note: The liquid of 700MHz&2600MHz typical liquid composition is provided by SATIMO.

Frequency:5200/5400/5600/5800MHz	
Ingredients	(% by weight)
Water	78
Mineral oil	11
Emulsifiers	9
Additives and Salt	2

Table 2 Recommended Tissue Dielectric Parameters

Frequency (MHz)	Head Tissue		Body Tissue	
	$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (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	52.0	2.73
5800	35.3	5.27	48.2	6.00

## 5.2 Simulate liquid

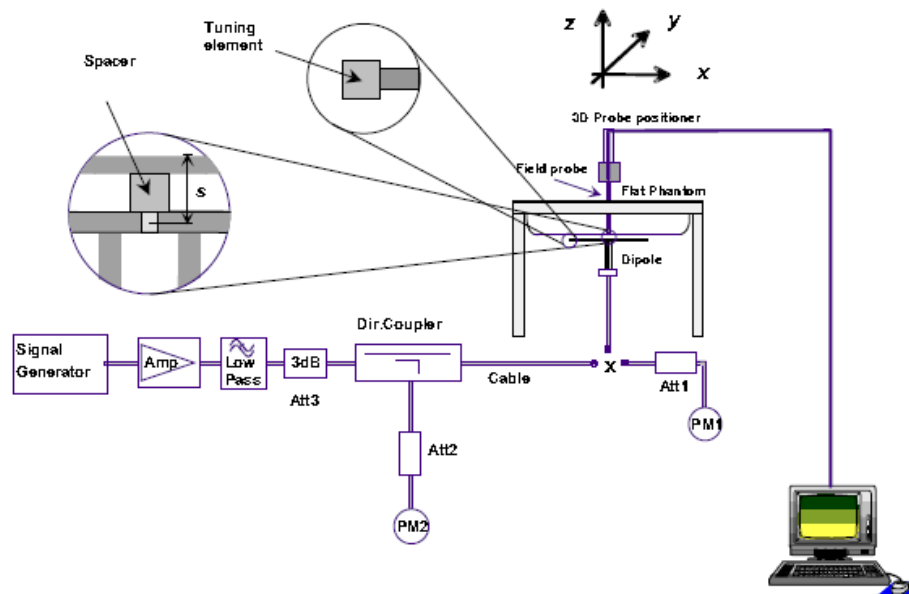
### Dielectric Performance of Body Tissue Simulating Liquid

Temperature: 23.2°C; Humidity: 64%;			
/	Frequency	Permittivity $\epsilon$	Conductivity $\sigma$ (S/m)
Target value	2450MHz	52.7±5%	1.95±5%
Validation value (2020-06-20)	2410MHz	52.65	1.93
	2412MHz	52.67	1.93
	2437MHz	52.70	1.94
	2440MHz	52.70	1.94
	2450MHz	52.70	1.94
	2460MHz	52.71	1.95
	2462MHz	52.71	1.95

### SAR System validation

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of  $\pm 10\%$ . The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

The following procedure, recommended for performing validation tests using box phantoms is based on the procedures described in the IEEE standard P1528. Setup according to the setup diagram below:



With the SG and Amp and with directional coupler in place, set up the source signal at the relevant frequency and use a power meter to measure the power at the end of the SMA cable that you intend to connect to the balanced dipole. Adjust the SG to make this, say, 0.01W (10 dBm). If this level is too high to read directly with the power meter sensor, insert a calibrated attenuator (e.g. 10 or 20 dB) and make a suitable correction to the power meter reading.

- Note 1: In this method, the directional coupler is used for monitoring rather than setting the exact feed power level. If, however, the directional coupler is used for power measurement, you should check the frequency range and power rating of the coupler and measure the coupling factor (referred to output) at the test frequency using a VNA.
- Note 2: Remember that the use of a 3dB attenuator (as shown in Figure 8.1 of P1528) means that you need an RF amplifier of 2 times greater power for the same feed power. The other issue is the cable length. You might get up to 1dB of loss per meter of cable, so the cable length after the coupler needs to be quite short.
- Note 3: For the validation testing done using CW signals, most power meters are suitable. However, if you are measuring the output of a modulated signal from either a signal generator or a handset, you must ensure that the power meter correctly reads the modulated signals.

The measured 1-gram averaged SAR values of the device against the phantom are provided in Tables 5 and Table 6. The humidity and ambient temperature of test facility were 64% and 23.2°C respectively. The body phantom were full of the body tissue simulating liquid. The EUT was supplied with full-charged battery for each measurement.

The distance between the back of the EUT and the bottom of the flat phantom is 10 mm (taking into account of the IEEE 1528 and the place of the antenna).

#### Body SAR system validation (1g)

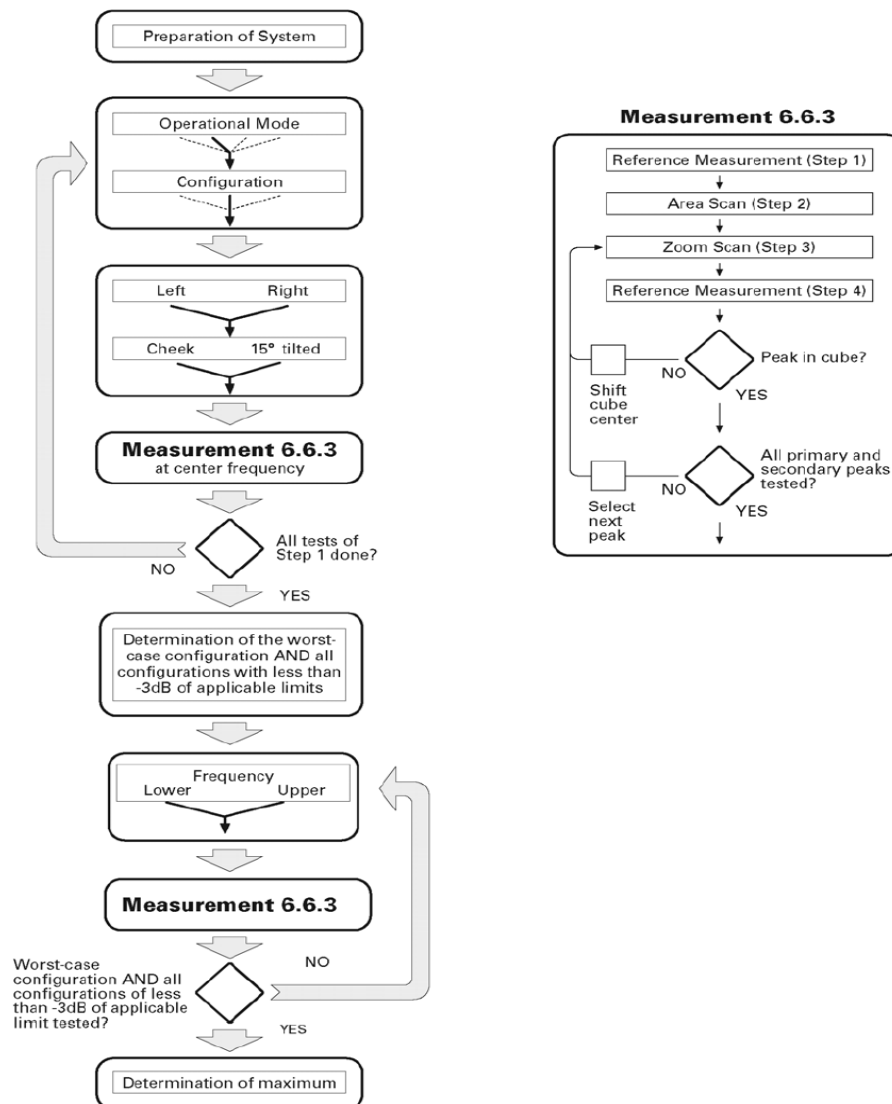
Frequency	Duty cycle	Target value (W/kg)	Test value (W/kg)	
			10 mW	1W
2450MHz(2020-06-20)	1:1	51.42±10%	0.5480	54.80

\* Note: Target value was referring to the measured value in the calibration certificate of reference dipole.

Note: All SAR values are normalized to 1W forward power.

## 5. SAR measurement procedure

The SAR test against the head phantom was carried out as follow:



Establish a call with the maximum output power with a base station simulator, the connection between the EUT and the base station simulator is established via air interface.

After an area scan has been done at a fixed distance of 2mm from the surface of the phantom on the source side, a 3D scan is set up around the location of the maximum spot SAR. First, a point within the scan area is visited by the probe and a SAR reading taken at the start of testing. At the end of testing, the probe is returned to the same point and a second reading is taken. Comparison between these start and end readings enables the power drift during measurement to be assessed.

Above is the scanning procedure flow chart and table from the IEEE p1528 standard. This is the procedure for which all compliant testing should be carried out to ensure that all variations of the device position and transmission behavior are tested.

## 6. Conducted RF Output Power

### 7.4 WIFI Conducted Power

#### WLAN 2.4GHz Band Conducted Power

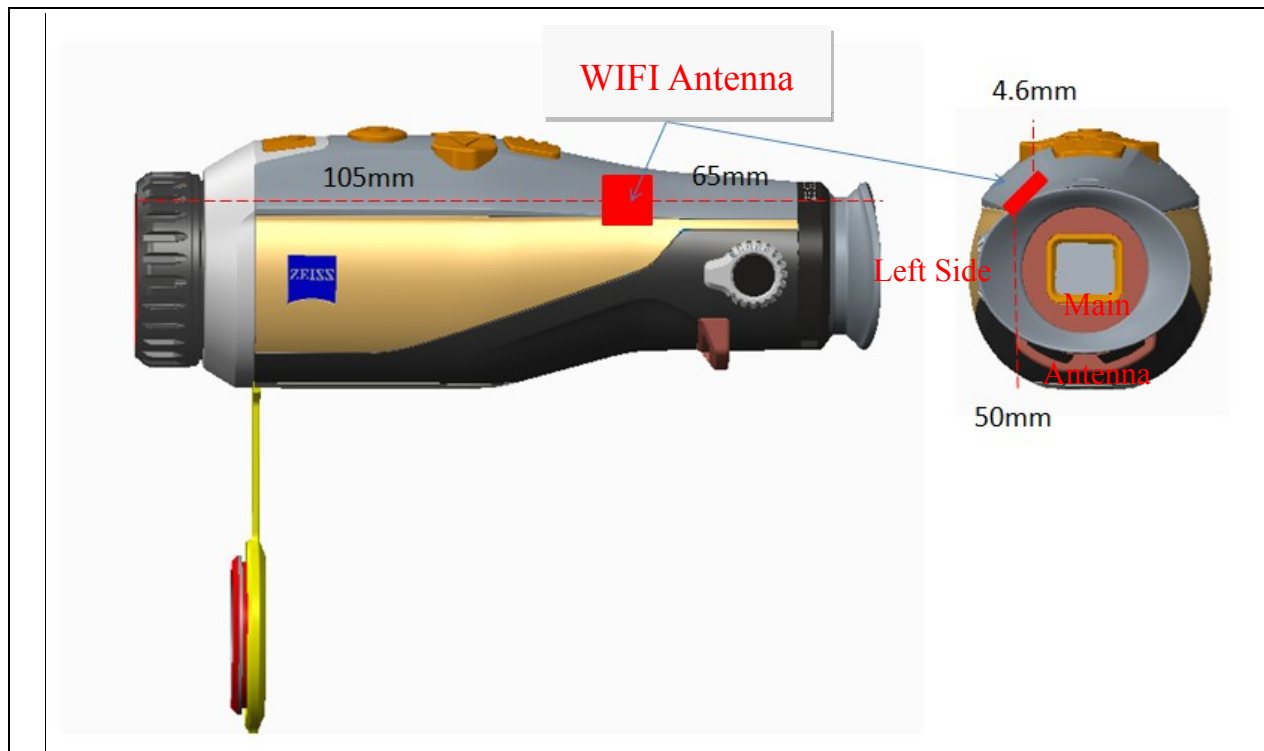
Channel/Freq.(MHz)	Maximum Conducted Out Power (dBm)		
	802.11b	802.11g	802.11n(HT20)
1(2412)	16.14	13.19	12.55
6(2437)	16.34	13.72	12.91
11(2462)	16.97	13.84	13.18

#### Note:

1. Per KDB248227 D01 v02r02, choose the highest output power channel to test SAR and determine further SAR exclusion
2. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at lowest data rate
3. Per KDB248227 D01 v02r02, 802.11g /11n-HT20/11n-HT40 is not required. . 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  $\leq 1.2\text{W/Kg}$ . Thus the SAR can be excluded.



### Antenna Location:



## 7. Scaling Factor calculation

Operation Mode	Channel /Frequency	Output Power(dBm)	Tune up Power in tolerance (dBm)	Max. Tune up(dBm)	Scaling Factor
WIFI 2.4G 802.11b	1/2412	16.14	$16.0 \pm 1.0$	17.00	1.219
	6/2437	16.34	$16.0 \pm 1.0$	17.00	1.164
	11/2462	16.97	$16.0 \pm 1.0$	17.00	1.007

## 8. Test Results

### Results overview of WIFI2.4G 802.11b

Body-worn(5mm)	Channel /Frequency	Mode	SAR Value (W/kg)1-g	Power drift(%)	Scaled Factor	Scaled SAR (W/Kg)1-g	SAR Plot.
Left Side	6/2437	DSSS	0.078	-2.16	1.164	0.091	/
Face Upward	1/2412	DSSS	0.144	0.76	1.219	0.176	/
Face Upward	6/2437	DSSS	<b>0.153</b>	-2.90	1.164	<b>0.178</b>	Yes
Face Upward	11/2462	DSSS	0.152	1.35	1.007	0.153	/

Note:

Per KDB941225 D06 v02r01, When the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested. As the manufacture requirement the separation distance use 5mm for Hotspot mode.

Per KDB Publication 941225 D01v03r01. RMC 12.2kbps was as primary mode SAR, when the primary mode SAR less than 1.2W/kg, secondary SAR (HSPA) was not requires.

When the 1-g SAR for the mid-band channel or the channel with the highest output power satisfy the following conditions, testing of the other channels in the band is not required. (Per KDB 447498 D01 General RF Exposure Guidance v06)

- $\leq 0.8$  W/kg, when the transmission band is  $\leq 100$  MHz
- $\leq 0.6$  W/kg, when the transmission band is between 100 MHz and 200 MHz
- $\leq 0.4$  W/kg, when the transmission band is  $\geq 200$  MHz

The priority (Main) and secondary(upper) antenna cannot tramsimit at the same time.

## 9. Measurement Uncertainty

No.	Uncertainty Component	Type	Uncertainty Value (%)	Probability Distribution	k	ci	Standard Uncertainty (%) $u_i(\%)$	Degree of freedom $\nu_{eff}$ or $\nu_i$
Measurement System								
1	- Probe Calibration	B	5.8	N	1	1	5.8	$\infty$
2	- Axial isotropy	B	3.5	R	$\sqrt{3}$	0.5	1.43	$\infty$
3	— Hemispherical Isotropy	B	5.9	R	$\sqrt{3}$	0.5	2.41	$\infty$
4	- Boundary Effect	B	1	R	$\sqrt{3}$	1	0.58	$\infty$
5	- Linearity	B	4.7	R	$\sqrt{3}$	1	2.71	$\infty$
6	- System Detection Limits	B	1.0	R	$\sqrt{3}$	1	0.58	$\infty$
7	Modulation response	B	3	N	1	1	3.00	
8	- Readout Electronics	B	0.5	N	1	1	0.50	$\infty$
9	- Response Time	B	1.4	R	$\sqrt{3}$	1	0.81	$\infty$
10	- Integration Time	B	3.0	R	$\sqrt{3}$	1	1.73	$\infty$
11	- RF Ambient Conditions	B	3.0	R	$\sqrt{3}$	1	1.73	$\infty$
12	- Probe Position Mechanical tolerance	B	1.4	R	$\sqrt{3}$	1	0.81	$\infty$
13	- Probe Position with respect to Phantom Shell	B	1.4	R	$\sqrt{3}$	1	0.81	$\infty$
14	- Extrapolation, Interpolation and Integration Algorithms for Max. SAR evaluation	B	2.3	R	$\sqrt{3}$	1	1.33	$\infty$
Uncertainties of the DUT								

15	- Position of the DUT	A	2.6	N	$\sqrt{3}$	1	2.6	5
16	- Holder of the DUT	A	3	N	$\sqrt{3}$	1	3.0	5
17	- Output Power Variation -SAR drift measurement	B	5.0	R	$\sqrt{3}$	1	2.89	$\infty$
<b>Phantom and Tissue Parameters</b>								
18	- Phantom Uncertainty(shape and thickness tolerances)	B	4	R	$\sqrt{3}$	1	2.31	$\infty$
19	Uncertainty in SAR correction for deviation(in permittivity and conductivity)	B	2	N	1	1	2.00	
20	- Liquid Conductivity Target -tolerance	B	2.5	R	$\sqrt{3}$	0.6	1.95	$\infty$
21	- Liquid Conductivity -measurement Uncertainty)	B	4	N	$\sqrt{3}$	1	0.92	9
22	- Liquid Permittivity Target tolerance	B	2.5	R	$\sqrt{3}$	0.6	1.95	$\infty$
23	- Liquid Permittivity -measurement uncertainty	B	5	N	$\sqrt{3}$	1	1.15	$\infty$
<b>Combined Standard Uncertainty</b>				RSS			10.63	
<b>Expanded uncertainty</b> (Confidence interval of 95 %)				K=2			21.26	

### System Check Uncertainty

No.	Uncertainty Component	Type	Uncertainty Value (%)	Probability Distribution	k	ci	Standard Uncertainty (%) $u_i(\%)$	Degree of freedom $V_{eff}$ or $v_i$
<b>Measurement System</b>								
1	- Probe Calibration	B	5.8	N	1	1	5.8	$\infty$
2	- Axial isotropy	B	3.5	R	$\sqrt{3}$	0.5	1.43	$\infty$

3	— Hemispherical Isotropy	B	5.9	R	$\sqrt{3}$	0.5	2.41	$\infty$
4	- Boundary Effect	B	1	R	$\sqrt{3}$	1	0.58	$\infty$
5	- Linearity	B	4.7	R	$\sqrt{3}$	1	2.71	$\infty$
6	- System Detection Limits	B	1	R	$\sqrt{3}$	1	0.58	$\infty$
7	Modulation response	B	0	N	1	1	0.00	
8	- Readout Electronics	B	0.5	N	1	1	0.50	$\infty$
9	- Response Time	B	0.00	R	$\sqrt{3}$	1	0.00	$\infty$
10	- Integration Time	B	1.4	R	$\sqrt{3}$	1	0.81	$\infty$
11	- RF Ambient Conditions	B	3.0	R	$\sqrt{3}$	1	1.73	$\infty$
12	- Probe Position Mechanical tolerance	B	1.4	R	$\sqrt{3}$	1	0.81	$\infty$
13	- Probe Position with respect to Phantom Shell	B	1.4	R	$\sqrt{3}$	1	0.81	$\infty$
14	- Extrapolation, Interpolation and Integration Algorithms for Max. SAR evaluation	B	2.3	R	$\sqrt{3}$	1	1.33	$\infty$
Uncertainties of the DUT								
15	Deviation of experimental source from numerical source	A	4	N	1	1	4.00	5
16	Input Power and SAR drift measurement	A	5	R	$\sqrt{3}$	1	2.89	5
17	Dipole Axis to Liquid Distance	B	2	R	$\sqrt{3}$	1	1.2	$\infty$
Phantom and Tissue Parameters								
18	- Phantom Uncertainty(shape	B	4	R	$\sqrt{3}$	1	2.31	$\infty$

	and thickness tolerances)							
19	Uncertainty in SAR correction for deviation(in permittivity and conductivity)	B	2	N	1	1	2.00	
20	- Liquid Conductivity Target –tolerance	B	2.5	R	$\sqrt{3}$	0.6	1.95	$\infty$
21	- Liquid Conductivity –measurement Uncertainty)	B	4	N	$\sqrt{3}$	1	0.92	9
22	- Liquid Permittivity Target tolerance	B	2.5	R	$\sqrt{3}$	0.6	1.95	$\infty$
23	- Liquid Permittivity –measurement uncertainty	B	5	N	$\sqrt{3}$	1	1.15	$\infty$
<b>Combined Standard Uncertainty</b>				RSS			10.15	
<b>Expanded uncertainty</b> (Confidence interval of 95 %)				K=2			20.29	

## 10. Equipment List

This table is a complete overview of the SAR measurement equipment. Devices used during the test described are marked ☒.

	EQUIPMENT	Model	Serial number	Calibration Date	Due Date
<input checked="" type="checkbox"/>	SAR Probe	SSE2	SN41/18 EPG0334	2019/12/10	2021/12/09
<input type="checkbox"/>	Dipole	SID750	SN 23/15 DIP0G750-378	2017/11/27	2020/11/26
<input type="checkbox"/>	Dipole	SID835	SN 09/13 DIP0G835-217	2017/11/27	2020/11/26
<input type="checkbox"/>	Dipole	SID900	SN 09/13 DIP0G900-215	2017/11/27	2020/11/26
<input type="checkbox"/>	Dipole	SID1800	SN 09/13 DIP1G800-216	2017/11/27	2020/11/26
<input type="checkbox"/>	Dipole	SID1900	SN 09/13 DIP2G000-218	2017/11/27	2020/11/26
<input type="checkbox"/>	Dipole	SID2000	SN 09/13 DIP2G000-219	2017/11/27	2020/11/26
<input checked="" type="checkbox"/>	Dipole	SID2450	SN_09/13_DIP2G450-220	2017/11/27	2020/11/26
<input type="checkbox"/>	Dipole	SID2600	SN 32/14_DIP2G600-338	2017/11/27	2020/11/26
<input type="checkbox"/>	Dipole	SWG5500	SN15/15 WGA39	2017/11/27	2020/11/26
<input checked="" type="checkbox"/>	Multimeter	Keithley-2000	4014020	2020/04/03	2021/04/03
<input checked="" type="checkbox"/>	System Simulator(Agilent 8960)	E5515C	GB 47200710	2019/11/27	2020/11/26
<input checked="" type="checkbox"/>	System Simulator(R&S)	CMW500	130805	2019/07/30	2020/07/29
<input checked="" type="checkbox"/>	KEYSIGHT	E7515A	MY56040357	2020/04/03	2021/04/03
<input checked="" type="checkbox"/>	Vector Network Analyzer(R&S)	ZVB8	A0802530	2020/04/03	2021/04/03
<input checked="" type="checkbox"/>	PC 3.5 Fixed Match Calibration Kit	ZV-Z32	100571	2019/11/29	2020/11/28
<input checked="" type="checkbox"/>	Dielectric Probe Kit	SCLMP	SN 09/13 OCPG51	2019/11/27	2020/11/26
<input checked="" type="checkbox"/>	Signal Generator	SMU200A	A140801888	2020/03/16	2021/03/15
<input checked="" type="checkbox"/>	Amplifier	Nucletudes	143060	2020/03/16	2021/03/15
<input checked="" type="checkbox"/>	Directional Coupler	DC6180A	305827	2020/03/16	2021/03/15
<input checked="" type="checkbox"/>	Power Meter	NRP2	A140401673	2020/03/16	2021/03/15
<input checked="" type="checkbox"/>	Power Sensor	NPR-Z11	1138.3004.02-114072-nq	2020/03/16	2021/03/15
<input checked="" type="checkbox"/>	Power Meter	NRVS	A0802531	2020/03/16	2021/03/15
<input checked="" type="checkbox"/>	Power Sensor	NRV-Z4	100069	2020/03/16	2021/03/15

## ANNEX A: Appendix A: SAR System performance Check Plots

(Please See Appendix A)

## ANNEX B: Appendix B: SAR Measurement results Plots

(Please See Appendix B)

## ANNEX C: Appendix C: Calibration reports

(Please See Appendix C)

## ANNEX D: Appendix D: SAR Test Setup

(Please See Appendix D)

—End of the Report—