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TEST REPORT

SCOPE OF WORK
FCC TESTING– 100146660

REPORT NUMBER
240530014SZN-005

ISSUE DATE	**[REVISED DATE]**
22 July 2024	[----------]

PAGES
71

DOCUMENT CONTROL NUMBER
FCC SAR_b
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SAR TEST REPORT

For

Hefei BOE Vision-electronic Technology Co.,Ltd.

Product Description: onn. 11 Tablet Pro

FCC ID: 2AYT5100146660

Model No.: 100146660

Report No.: 240530014SZN-005

Issue Date: 15 July 2024

Prepared and Checked by:	Approved by:
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1. GENERAL INFORMATION

Applicant:	Hefei BOE Vision-electronic Technology Co.,Ltd. NO.2177 Dongfang RD, Xinzhan General Pilot Zone, Hefei, Anhui, 230012, P.R.China
Manufacturer:	Hefei BOE Vision-electronic Technology Co.,Ltd. NO.2177 Dongfang RD, Xinzhan General Pilot Zone, Hefei, Anhui, 230012, P.R.China
Product Description:	onn. 11 Tablet Pro
Model Number:	100146660, TBRED100146660, TBSIL100146660, TBGRY100146660, TBROS100146660
Sample Number:	Z240530014-003
File Number:	240530014SZN-005
Date of Test:	30 May 2024 to 09 July 2024

The above equipment was tested by Intertek Testing Services Shenzhen Ltd. Longhua Branch. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in IEEE 1528-2013 and KDB 865664. This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in ANSI/IEEE C95.1-1992.

The test results of this report relate only to the tested sample identified in this report

The Model: TBRED100146660, TBSIL100146660, TBGRY100146660, TBROS100146660 are the same as the Model: 100146660 in hardware and electrical aspect. The difference in model number serves as packaging and marketing purpose only.

For the model of EUT cable, the Model: 8B47-4CS0002R-FG, 8B47-4CS0003R-FG, 8B47-4CS0004R-FG is the same as the Model: 8B47-4CS0001R-FG in hardware aspect. The difference in model number serves as shell colour, corresponding to different colours of EUT series models. Only the 8B47-4CS0001R-FG has used in the test.

2. STATEMENT OF COMPLIANCE

The Maximum reported SAR1g

Band	Mode	Test Position	Channel /Frequency (MHz)	Limit SAR1g 1.6 W/kg	
				Measured SAR1g (W/kg)	Reported SAR1g (W/kg)
WIFI 2.4GHz	802.11b	Top side	11/2462	0.576	0.632
U-NII-1	802.11n20	Top side	36/5180	0.608	0.628
U-NII-2A	802.11n20	Top side	52/5260	1.13	1.178
U-NII-2C	802.11n20	Top side	100/5500	0.924	0.965
U-NII-3	802.11n20	Top side	149/5745	1.02	1.073
WIFI 2.4GHz*	802.11b	Top side	6/2437	0.792	0.905
U-NII-1*	802.11n40	Top side	38/5190	0.246	0.248
U-NII-2A*	802.11n40	Top side	54/5270	0.515	0.544
U-NII-2C*	802.11n40	Top side	102/5510	1.07	1.147
U-NII-3*	802.11n40	Top side	151/5775	0.69	0.695

The SAR values found for the onn. 11 Tablet Pro are below the maximum recommended levels of 1.6 W/kg as averaged over any 1g tissue according to the ANSI C95.1-1992. The SAR values in the table above are Body SAR.

The estimated SAR for BT is: 0.166 W/kg

The maximum reported SAR value is: 1.178 + 0.166 = 1.34 W/kg (1g).

Note: * mean the proximity sensor is triggered.

3. Equipment Under Test (EUT) TECHNICAL DESCRIPTION

Characteristics	Description	
Product Name:	onn. 11 Tablet Pro	
Device type:	Portable device	
Exposure Category:	Uncontrolled Environment/General Population	
Test Mode(s):	WiFi 2.4G (DSSS/OFDM) WiFi 5G (OFDM)	
	Bluetooth (GFSK, π/4 DQPSK, 8DPSK)	
Device Class:	B	
Antenna Type:	IFA FPC Antenna , Monopole Antenna	
Antenna Gain:	Bluetooth: -1.4dBi WiFi 2.4G: -1.4dBi WiFi 5.0G: 1.1dBi	
Operating Frequency Range(s)	Band	Frequency Rang (MHz)
	BT	2400-2483.5
	WiFi 2.4G	2400-2483.5
	WiFi 5G	5150MHz~5250 MHz, 5250MHz~5350MHz, 5470MHz-5725MHZ, 5725MHz~5850MHz
	BT (EDR): 0-39-78 BT (BLE): 0-19-39 WiFi 2.4G: 802.11b/g/n 20M: 1-6-11 WiFi 5G: 802.11a/n/ac 20M: 36-40-48, 52-56-64, 100-116-140, 149-157-165 802.11n/ac 40M: 38-NA-46, 54-NA-62, 102-110-134, 151-NA-159 802.11a 80M: 42, 58, 106, 155 (There is only one channel per band.)	
Power supply:	D.C. 3.85V with battery	
	D.C. 5V/3A or D.C. 9V/2.22A by adaptor	
Product Software Version:	tc642_wifi_14_PVT_userdebug_009_202405240332_ROW	
Product Hardware Version:	Hw version: TC642_MB_V1	

Note:
1. NA is Not Applicable
2. For more details, please refer to the User's manual of the EUT.
3. The sample under test was selected by the Client.

4. Auxiliary Equipment Details

Description	Manufacturer	Description
AC Adapter	ASAP Technology(Jiangxi) Co., Ltd.	LACA271(Input:100-240V~,50/60Hz,0.5A;Output:5.0Vdc,3.0A or 9.0Vdc,2.22A)
C to C cable	Luxshare-ICT	8B47-4CS0001R-FG (0.915m length, shielded, without ferrite core)
SD card	SanDisk	BE0934314559D(provided by Intertek)

5. Test Facility

Site Description	
EMC Lab.	The Laboratory has been assessed and proved to be in compliance with CNAS/CL01: 2006(identical to ISO/IEC17025: 2005) The Certificate Registration Number is L0327
	FCC Registration Number:435976 FCC Designation Number:CN1188 ISED Registration Number: 2055C ISED Cab Identifier: CN0038
Name of Firm	Intertek Testing Services Shenzhen Ltd. Longhua Branch
Site Location	101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, ShenZhen, P.R. China

6. Guidance Standard

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

☒FCC 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 to 300 GHz. (IEEE Std C95.1-1991)

☒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.

☒KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04: SAR Measurement Requirements for 100 MHz to 6 GHz

☒KDB 865664 D02 SAR Reporting v01r02

☒KDB 690783 D01 SAR Listings on Grants v01r03

☒KDB 447498 D01 Mobile Portable RF Exposure v06: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies

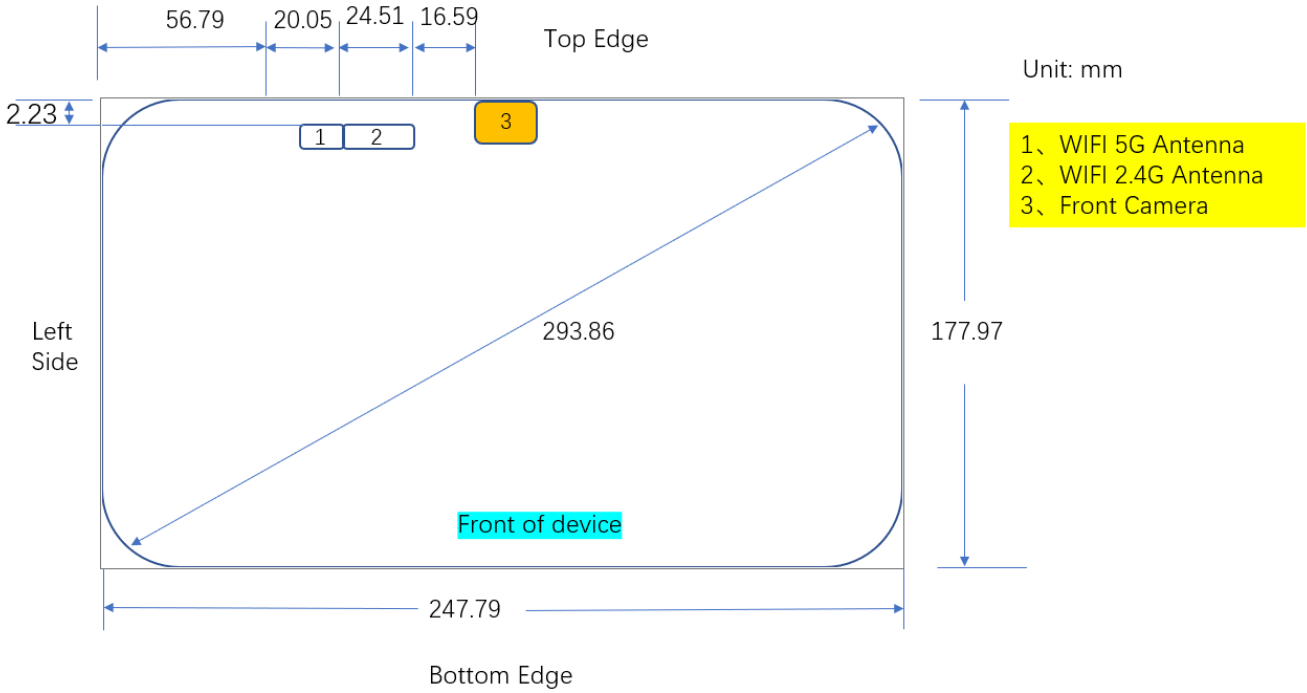
☒KDB 941225 D06 Hotspot Mode v02r01: SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities

☒KDB 248227 D01 802.11 Wi-Fi SAR v02r02: SAR Guidance for IEEE 802.11 (Wi-Fi) Transmitters

☒KDB 616217 D04 SAR for laptop and tablets v01r02: SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers

Remark:
This portable wireless equipment has been measured in all cases requested by the relevant standards. Test results in Chapter 11 of this test report are below limits specified in the relevant standards for the tested bands only.

7. EUT Antenna Locations



Test position consideration:

Distance of EUT antenna-to-edge/surface(mm), Test distance: 0mm						
Antennas	Rear Face	Front Face	Top	Bottom	Left Side	Right Side
5G WiFi	2.2	0.34	2.23	175.74	56.79	170.95
2.4G WiFi&BT	2.2	0.34	2.23	175.74	76.84	146.44

Note:

Per KDB 447498 D01v06, for handsets the test separation distance is determined by the smallest distance between the outer surface of the device and the user, which is 0 mm body-worn SAR.

All Sides for SAR Testing Evaluation (Test distance: 0mm):

Mode	Location	Distance from ANT (mm)	Max. tune-up Power (mW)	Exemption with Max. Allowed Power (mW)	SAR Test
BT/ EDR	Front Side	0.34	3.98	9.60	N/A(see note c)
	Rear Side	2.2		9.60	N/A
	Top Side	2.23		9.60	N/A
	Bottom Side	175.74		1353.41	N/A
	Left Side	76.84		364.41	N/A
	Right Side	146.44		1060.41	N/A
BT/BLE	Front Side	0.34	3.16	9.53	N/A(see note c)
	Rear Side	2.2		9.53	N/A
	Top Side	2.23		9.53	N/A
	Bottom Side	175.74		1352.65	N/A
	Left Side	76.84		363.65	N/A
	Right Side	146.44		1059.65	N/A
2.4G WIFI	Front Side	0.34	63.10	9.56	N/A(see note c)
	Rear Side	2.2		9.56	YES
	Top Side	2.23		9.56	YES
	Bottom Side	175.74		1353.00	N/A
	Left Side	56.79		163.50	N/A
	Right Side	170.95		1305.10	N/A
U-NII-1	Front Side	0.34	44.67	6.59	N/A(see note c)
	Rear Side	2.2		6.59	YES
	Top Side	2.23		6.59	YES
	Bottom Side	175.74		1323.31	N/A
	Left Side	56.79		133.81	N/A
	Right Side	170.95		1275.41	N/A
U-NII-2A	Front Side	0.34	39.81	6.54	N/A(see note c)
	Rear Side	2.2		6.54	YES
	Top Side	2.23		6.54	YES
	Bottom Side	175.74		1322.80	N/A
	Left Side	56.79		133.30	N/A
	Right Side	170.95		1274.90	N/A
U-NII-2C	Front Side	0.34	8.91	6.28	N/A(see note c)
	Rear Side	2.2		6.28	YES
	Top Side	2.23		6.28	YES
	Bottom Side	175.74		1321.36	N/A
	Left Side	56.79		131.86	N/A
	Right Side	170.95		1273.46	N/A

U-NII-3	Front Side	0.34	31.62	6.26	N/A(see note c)
	Rear Side	2.2		6.26	YES
	Top Side	2.23		6.26	YES
	Bottom Side	175.74		1319.98	N/A
	Left Side	56.79		130.48	N/A
	Right Side	170.95		1272.08	N/A

Note: SAR testing exemption according to KDB 447498 D01 Clause 4.3.1 with the following fomula.

a) For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g SAR test exclusion thresholds are determined by the following:
[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR,
*where f(GHz) is the RF channel transmit frequency in GHz
*When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

b) For 100 MHz to 6 GHz and test separation distances > 50 mm, the 1-g SAR test exclusion thresholds are determined by the following
{[Power allowed at numeric threshold for 50 mm in step a)] + [(test separation distance – 50 mm)·10]} mW, for > 1500 MHz and ≤ 6 GHz

c) Body-worn SAR assessments are required.
Referring to KDB 616217 D04, when the overall diagonal dimension of the keyboard and/or display section of a laptop or tablet is > 20 cm, the test distance is 0mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge. Exposures from antennas through the front (top) surface of the display section of a full-size tablet, away from the edges, are generally limited to the user's hands. Exposures to hands for typical consumer transmitters used in tablets are not expected to exceed the extremity SAR limit; therefore, SAR evaluation for the front surface of tablet display screens are generally not necessary.

8. Power Reduction By Proximity Sensing

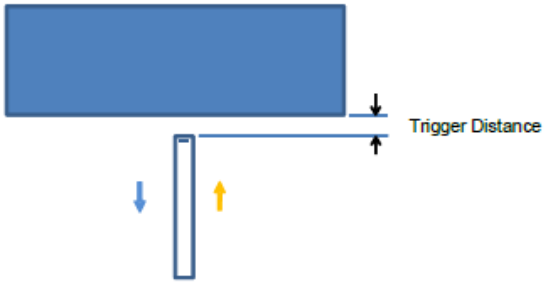
8.1 Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Rear surface of the DUT was placed directly below the flat phantom. The DUT was moved toward the phantom in accordance with the steps outlined in KDB 616217 §6.2 to determine the trigger distance for enabling power reduction. The DUT was moved away from the phantom to determine the trigger distance for resuming full power.

The measurement was then repeated for the rear surface and edge 1 of a tablet (Top Edge).

The DUT featured a visual indicator on its display that showed the status of the proximity sensor (Triggered or not triggered). This was used to determine the status of the sensor during the proximity sensor assessment as monitoring the output power directly was not practical without affecting the measurement.

It was confirmed separately that the output power was altered according to the proximity sensor status indication. This was achieved by observing the proximity sensor status at the same time as monitoring the conducted power. Section 12 contains both the full and reduced conducted power measurements.



Proximity Sensor Trigger Distance Assessment
KDB 616217 §6.2 , **Edge 1**

Proximity Sensor Trigger Distance Assessment
KDB 616217 §6.2, **Rear & Front**

Note:

Direction of DUT travel for determination of power reduction triggering point.

Direction of DUT travel for determination of full power resumption triggering point.

Summary of Trigger Distances

Tissue simulating liquid	Trigger distance (Rear face)		Trigger distance (Top edge)	
	Moving Toward the Phantom	Moving Away from the Phantom	Moving Toward the Phantom	Moving Away from the Phantom
2450	7mm	7mm	7mm	7mm
5200	7mm	7mm	7mm	7mm
5300	7mm	7mm	7mm	7mm
5600	7mm	7mm	7mm	7mm
5800	7mm	7mm	7mm	7mm

8.2 Proximity Sensor Triggering Distance Measurement Results

2.4G WiFi

Top, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT & Output power in dBm											
Distance(mm)	12	11	10	9	8	7	6	5	4	3	2
2.4G WiFi	17.6	17.6	17.6	17.6	17.6	12.7	12.7	12.7	12.7	12.7	12.7

5G Wifi

Top, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT & Output power in dBm											
Distance(mm)	12	11	10	9	8	7	6	5	4	3	2
Band I	16.36	16.36	16.36	16.36	16.36	6.07	6.07	6.07	6.07	6.07	6.07
Band II	15.91	15.91	15.91	15.91	15.91	5.76	5.76	5.76	5.76	5.76	5.76
Band III	9.33	9.33	9.33	9.33	9.33	4.7	4.7	4.7	4.7	4.7	4.7
Band IV	14.78	14.78	14.78	14.78	14.78	5.57	5.57	5.57	5.57	5.57	5.57

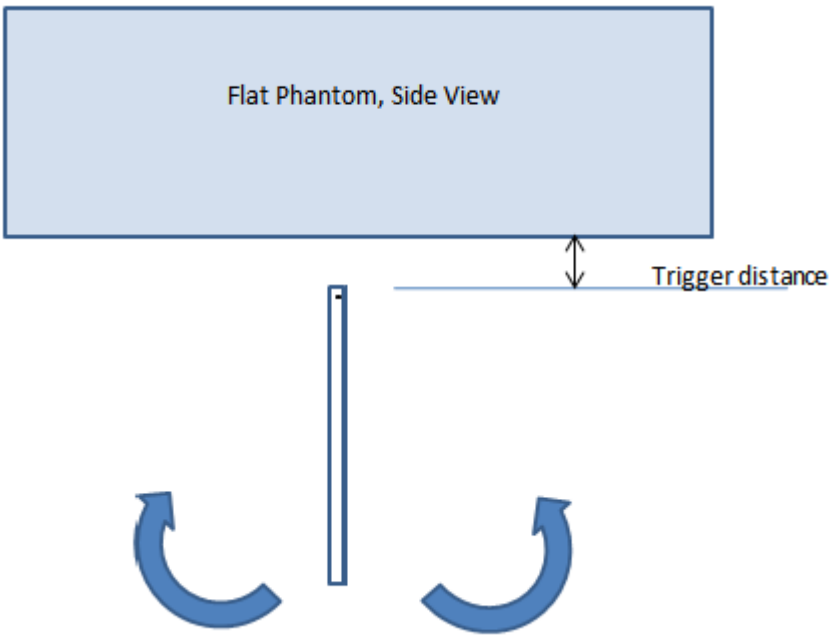
8.3 Proximity Sensor Coverage (KDB 616217 §6.3)

As there is no spatial offset between the antenna and the proximity sensor element, proximity sensor coverage did not need to be assessed.

8.4 Proximity Sensor Tilt Angle Assessment (KDB 616217 §6.4)

The DUT was positioned directly below the flat phantom at the minimum measured trigger distance with left side parallel to the base of the flat phantom for each band.

The EUT was rotated about left side for angles up to +/- 45°. If the output power increased during the rotation the DUT was moved 1mm toward the phantom and the rotation repeated. This procedure was repeated until the power remained reduced for all angles up to +/- 45°.



Proximity sensor tilt angle assessment (Left side) KDB 616217 §6.4

Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering for Top Edge

Band	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over +/-45°	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
2.4G WiFi	7mm	7mm	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
5G WiFi band I	7mm	7mm	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
5G WiFi band II	7mm	7mm	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
5G WiFi band III	7mm	7mm	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
5G WiFi band IV	7mm	7mm	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON

9. RF Exposure

9.1 LIMITS

Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and ankles
0.08	1.6	4.0

Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

9.2 EVALUATION

According to FCC KDB447498 D01 and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] · [$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR,[16] where

   - $f_{(GHz)}$ is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation[17]
   - The result is rounded to one decimal place for comparison

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

Routine SAR evaluation refers to that specifically required by § 2.1093, using measurements or computer simulation. Portable transmitters with output power greater than the applicable low threshold require SAR testing to qualify for TCB approval.

Exclusion Thresholds = $\boldsymbol{P\sqrt{F}/D}$
P= Maximum turn-up power in mW
F= Channel frequency in GHz
D= Minimum test separation distance in mm

Test Distance (5mm)

Band	Mode	Frequency (GHz)	MAX Power (dBm)	Tune Up Power (dBm)	Max Tune Up Power (dBm)	Max Tune Up Power (mW)	Exclusion Thresholds	Limit
Bluetooth	EDR/DH5	2.441	5.6	4.5±1.5	6.0	3.98	1.24	3
Bluetooth	BLE	2.480	4.0	3.5±1.5	5.0	3.16	1.00	3

Test Distance (7mm)

Band	Mode	Frequency (GHz)	MAX Power (dBm)	Tune Up Power (dBm)	Max Tune Up Power (dBm)	Max Tune Up Power (mW)	Exclusion Thresholds	Limit
2.4G WiFi	802.11g	2.462	17.8	16.5±1.5	18	63.10	14.14	3
U-NII-1	802.11n20	5.180	16.36	15.0±1.5	16.5	44.67	14.52	3
U-NII-2A	802.11n20	5.260	15.91	14.5±1.5	16.0	39.81	13.04	3
U-NII-2C	802.11n20	5.700	9.33	8.0±1.5	9.5	8.91	3.04	3
U-NII-3	802.11n20	5.825	14.78	13.5±1.5	15.0	31.62	10.83	3

Result: SAR measurement for WIFI is required.

10. Specific Absorption Rate (SAR)

10.1 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.

10.2 SAR DEFINITION

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

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

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

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

$$SAR = c\left(\frac{\delta T}{\delta t}\right)$$

Where: C is the specific head capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

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

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

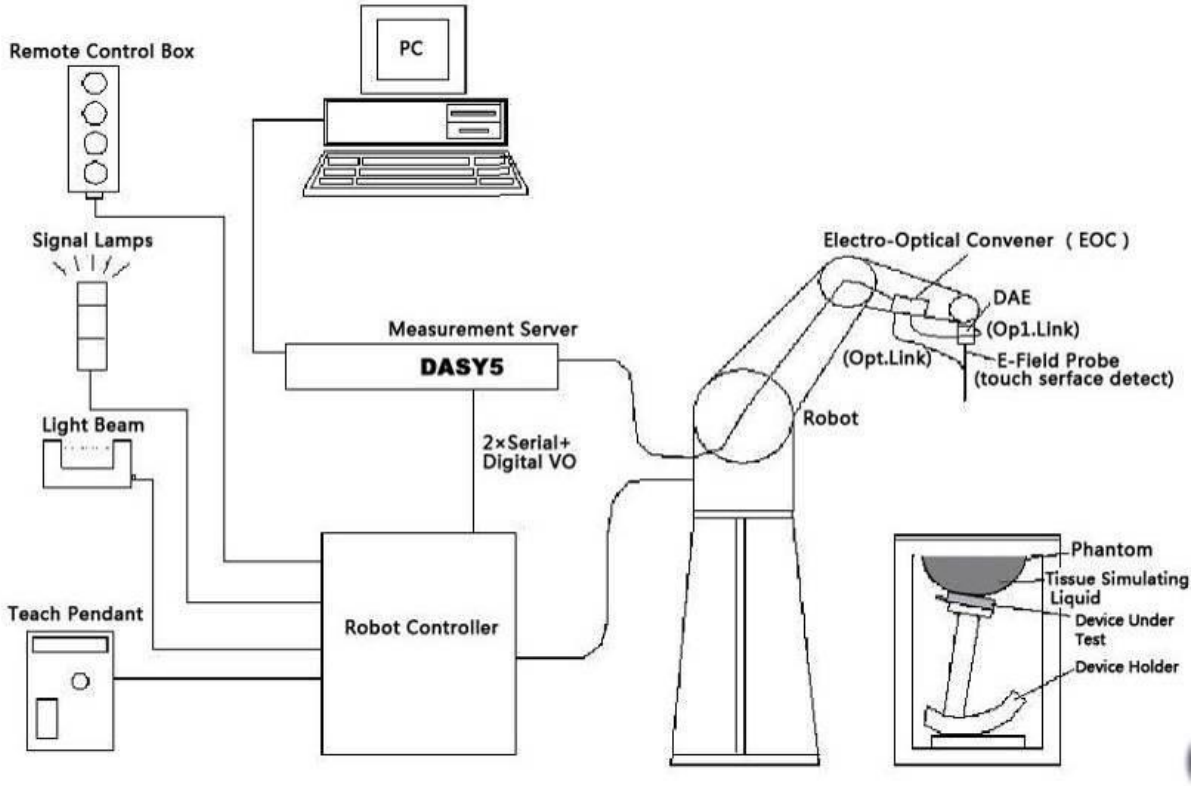
However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

11. SAR Measurements System Configuration

11.1 SAR MEASUREMENT SET-UP

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

- A standard high precision 6-axis robot (Stäubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (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.
- 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.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win 7 profesional operating system and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.



Picture 1 SAR Lab Test Measurement Set-up

11.2 DASY5 E-FIELD PROBE SYSTEM

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multifiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY5 software reads the reflection turning a software approach and looks for the maximum using 2nd ord curve fitting. The approach is stopped at reaching the maximum.

Probe Specifications:

Model:	EX3DV4
Calibration:	ISO/IEC 17025 calibration service available
Probe Length:	337 mm
Probe Tip Length:	9 mm
Body Diameter:	10 mm
Tip Diameter:	2.5 mm
Application:	High Precision dosimetric measurements in any exposure scenario (e.g., very strong Picture 2 E-field Probe gradient fields).

Picture 2 E-field Probe

11.3 E-FIELD PROBE CALIBRATION

Each E-Probe/Probe Amplifier combination has unique calibration parameters. A TEM cell calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm^2) using an RF Signal generator, TEM cell, and RF Power Meter.

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and inn a waveguide or other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees until the three channels show the maximum reading. The power density readings equate to 1 mw/ cm^2.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The E-field in the medium correlates with the temperature rise in the dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where:
Δt = Exposure time (30 seconds),
C = Heat capacity of tissue (brain or muscle),
ΔT = Temperature increase due to RF exposure.

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

Where:
σ = Simulated tissue conductivity,
ρ = Tissue density (kg/m^3).

11.4 OTHER TEST EQUIPMENT

11.4.1 Data Acquisition Electronics (DAE)

The data acquisition electronics 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 is accomplished through an optical downlink for 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.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Picture 3 DAE

11.4.2 Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX90XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability 0.02mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements (brushless synchron motors; no stepper motors)
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)

Picture 4 DASY 5

11.4.3 Measurement Server

The Measurement server is based on a PC/104 CPU broad 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 DASY I/O broad, which is directly connected to the PC/104 bus of the CPU broad.

Picture 5 Server for DASY 5

The measurement server performs all real-time data evaluation of field measurements and surface detection, controls robot movements and handles safety operation. The PC operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with an expansion port which is reserved for future applications. Please note that this expansion port does not have a standardized pinout, and therefore only devices provided by SPEAG can be connected. Devices from any other supplier could seriously damage the measurement server.

11.4.4 Device Holder for Phantom

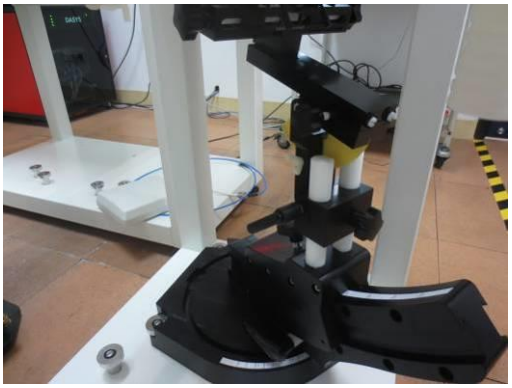
The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ±20%. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

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 are the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

The DASY device holder is constructed 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.

<Laptop Extension Kit>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin-SAM and ELI phantoms.

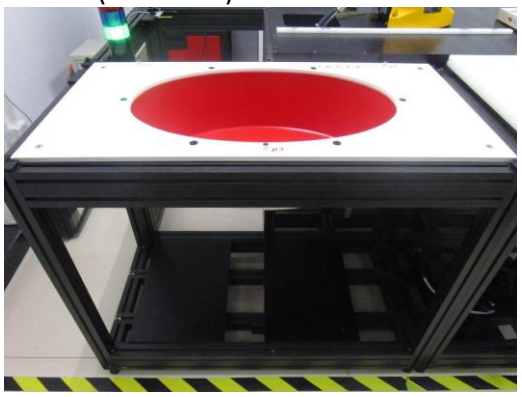


Picture 6 Device Holder

11.4.5 Phantom

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.

Shell Thickness:	2±0.2 mm
Filling Volume:	Approx. 30 liters
Dimensions:	190×600×0 mm (H x L x W)



Picture 7 ELI Phantom

11.5 SCANNING PROCEDURE

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max. ± 5 %.

The “surface check” measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot. Before starting the area scan a grid spacing is set according to FCC KDB Publication 865664. During scan the distance of the probe to the phantom remains unchanged. After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

Zoom Scan

After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm.

Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses. The DASY5 system allows evaluations that combine measured data and robot positions, such as:

- maximum search
- extrapolation
- boundary correction
- peak search for averaged SAR

During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard’s method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space.

They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard’s method for extrapolation.

A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

Table 1: Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01

Frequency	Maximum Area Scan Resolution (mm) (Δxarea, Δyarea)	Maximum Zoom Scan Resolution (mm) (Δxzoom, Δyzoom)	Maximum Zoom Scan Spatial Resolution (mm) Δzzoom(n)	Minimum Zoom Scan Volume (mm) (x,y,z)
≤2 GHz	≤15	≤8	≤5	≥ 30
2-3 GHz	≤12	≤5	≤5	≥30
3-4 GHz	≤12	≤5	≤4	≥28
4-5 GHz	≤10	≤4	≤3	≥25
5-6 GHz	≤10	≤4	≤2	≥22

11.6 DATA STORAGE AND EVALUATION

11.6.1 Data Storage

The DASY5 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 ".DAE4". 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 set up, 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], [mW/g], [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 loss less media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

11.6.2 Data Evaluation by SEMCAD

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 $Norm_i$, a_{i0}, a_{i1}, a_{i2}
- Conversion factor $ConvF_i$
- Diode compression point Dcp_i

Device parameters:
- Frequency f
- Crest factor cf

Media parameters:
- Conductivity
- Density

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$\mathbf{V_i = U_i + U_i^2 \cdot c f / dcp_i}$

With $\mathbf{V_i}$ = compensated signal of channel i (i = x, y, z)
$\mathbf{U_i}$ = input signal of channel i (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
$\mathbf{dcp_i}$ = diode compression point (DASY parameter)

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

E-field probes: $\mathbf{E_i = (V_i / Norm_i \cdot ConvF)^{1/2}}$

H-field probes: $\mathbf{H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2) / f}$

With $\mathbf{V_i}$ = compensated signal of channel i (i = x, y, z)
$\mathbf{Norm_i}$ = sensor sensitivity of channel i (i = x, y, z)
[mV/(V/m)2] for E-field Probes
ConvF = sensitivity enhancement in solution
$\mathbf{a_{ij}}$ **=** sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
$\mathbf{E_i}$ = electric field strength of channel i in V/m
$\mathbf{H_i}$ = magnetic field strength of channel i in A/m

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

$\mathbf{E_{tot} = (E_x^2 + E_Y^2 + E_z^2)^{1/2}}$

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

$\mathbf{SAR = (E_{tot})\ 2 \cdot \sigma / (\rho \cdot 1000)}$

with **SAR** = local specific absorption rate in mW/g
$\mathbf{E_{tot}}$ = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm^3

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. The power flow density is calculated assuming the excitation field to be a free space field.

$\mathbf{P_{pwe} = E_{tot}^2 / 3770}$ **or** $\mathbf{P_{pwe} = H_{tot}^2 \cdot 37.7}$

with $\mathbf{P_{pwe}}$ = equivalent power density of a plane wave in mW/cm^2
$\mathbf{E_{tot}}$ = total electric field strength in V/m ; $\mathbf{H_{tot}}$ = total magnetic field strength in A/m

11.7 TISSUE-EQUIVALENT LIQUID

11.7.1 Tissue-equivalent Liquid Ingredients

The liquid is consisted of water, salt and Glycol. The liquid has previously been proven to be suited for worst-case. The Table 2 & 3 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the KDB 865664 D01.

Table 2: Recommended Dielectric Performance of Tissue

MIXTURE (%)	FREQUENCY (Head) 2450MHz
Water	55
TWEEN	45
Dielectric Parameters Target Value	f=2450MHz ε=39.2 σ=1.80

MIXTURE (%)	FREQUENCY (Head) 5GHz
Water	56
Oxidised mineral oil	44
Dielectric Parameters Target Value	f=5200MHz ε=36.0 σ=4.66 f=5300MHz ε=35.9 σ=4.76 f=5600MHz ε=35.5 σ=5.07 f=5800MHz ε=35.3 σ=5.27

11.7.2 Tissue-equivalent Liquid Properties

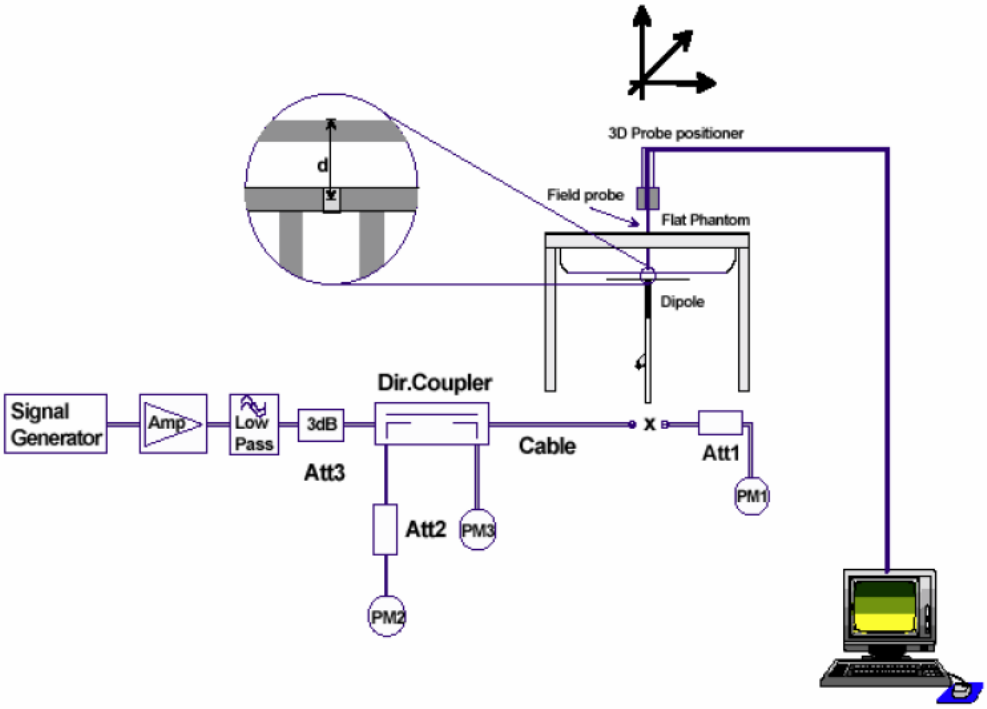
Table 3: Dielectric Performance of Head Tissue Simulating Liquid

Temperature: 21°C Relative humidity: 57%				
Frequency (MHz)	Measured Date	Description	Dielectric Parameters	
			εr	σ(s/m)
2450	30 June 2024	Target Value ±5% window	39.2 37.24—41.16	1.80 1.71 — 1.89
		Measurement Value	38.25	1.882
5200	30 June 2024	Target Value ±5% window	36.0 34.20—37.80	4.66 4.43 — 4.89
		Measurement Value	34.807	4.564
5300	30 June 2024	Target Value ±5% window	35.9 34.11—37.70	4.76 4.52 — 5.00
		Measurement Value	34.738	4.649
5600	30 June 2024	Target Value ±5% window	35.5 33.73—37.28	5.07 4.82 — 5.32
		Measurement Value	34.278	4.92
5800	30 June 2024	Target Value ±5% window	35.3 33.54 — 37.07	5.27 5.01 — 5.53
		Measurement Value	33.938	5.124

11.8 SYSTEM CHECK

11.8.1 Description of System Check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulants were measured every day using the dielectric probe kit and the network analyzer. A system check measurement was made following the determination of the dielectric parameters of the simulant, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the table 5. System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (±10 %). System check is performed regularly on all frequency bands where tests are performed with the DASY5 system.



Picture 8 ystem Check Set-up

Justification for Extended SAR Dipole Calibrations

Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (< - 20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB 865664 D01:

11.8.2 System Check Results

Table 5: System Check for Simulating Liquid

Measurement Date	Frequency (MHz)	Liquid Type (head/body)	1W Target SAR1g (W/kg)	Measured SAR1g (W/kg)	1W Normalized SAR1g (W/kg)	Limit (±10% Deviation)
30 June 2024	2450	Head	52.40	12.7	50.8	3.05
30 June 2024	5200	Head	76.40	7.29	72.90	4.58
30 June 2024	5300	Head	77.90	7.66	76.60	1.67
30 June 2024	5600	Head	80.30	8.18	81.80	1.87
30 June 2024	5800	Head	78.00	7.77	77.7	3.85

Note:
For 2450MHz system check input power: 250mW
For 5GHz system check input power: 100mW

12. Measurement Procedures

12.1 GENERAL DESCRIPTION OF TEST PROCEDURES

For WLAN SAR testing, WLAN engineering testing software installed on the DUT can provide continuous transmitting RF signal. This RF signal utilized in SAR measurement has almost 100% duty cycle and its crest factor is 1.

For the 802.11a/b/g/n/ac SAR tests, a communication link is set up with the test mode software for WIFI mode test. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. Provided higher maximum output power is not specified for the other channels, channels 1, 6, 11, 36, 40, 48, 46, 42 are used to configure 22 MHz DSSS and 20/40/80MHz OFDM channels for SAR measurements; otherwise, the closest adjacent channel with the highest maximum output power specified for production units should be tested instead of channels 1, 6, 11,40, 48, 46 or 42. In addition, SAR test reduction with respect to reported SAR and transmission band width according to 4.3.3 of KDB Publication 447498 D01 may also be applied.

802.11a/b/g/n/ac operating modes are tested independently according to the service requirements in each frequency band. 802.11a/b/g/n/ac modes are tested on the maximum average output channel.

SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

a) When the reported SAR of the highest measured maximum output power channel (see 3.1) for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
b) When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied (see 11.1.2, including subclauses). SAR is not required for the following 2.4 GHz OFDM conditions.

a) When KDB Publication 447498 D01 SAR test exclusion applies to the OFDM configuration.
b) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

12.2 MEASUREMENT VARIABILITY

Per FCC KDB Publication 865664 D01, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

1. Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
2. When the original highest measured SAR is ≥ 0.80 W/kg, 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 W/kg (~ 10% from the 1-g SAR limit).
4. Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

13. TEST RESULTS

13.1 Conducted Power Results

Test Condition:

1. Conducted Measurement
   EUT was set for low, mid, high channel with modulated mode and highest RF output power.
   The base station simulator was connected to the antenna terminal.

2 Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.

3 Environmental Conditions

Temperature	22°C
Relative Humidity	55%
Atmospheric Pressure	1009mbar

4 Test Date: 9 June 2021

Test Procedures:
The output power was measured using power meter at low, mid, and hi channels.

Bluetooth Measurement Result

Mode	Frequency (MHz)	Output Power(dBm)	Tune up limited(dBm)
DH5	2402	4.3	4.5±1.5
	2441	5.6	4.5±1.5
	2480	5.5	4.5±1.5
2DH5	2402	4.3	4.5±1.5
	2441	5.5	4.5±1.5
	2480	5.5	4.5±1.5
3DH5	2402	4.2	4.5±1.5
	2441	5.6	4.5±1.5
	2480	5.5	4.5±1.5

BLE Measurement Result

Channel number	Frequency (MHz)	Output Power(dBm)	Tune up limited(dBm)
0	2402	1.3	3.0±2
19	2440	3.5	3.0±2
39	2480	4.0	3.0±2

WIFI Mode 2.4G(Normal mode)

Mode	Channel number	Frequency (MHz)	Data rate (Mbps)	Average Output Power (dBm)	Average Tune up limited (dBm)
802.11b	1	2412	1	17.1	16.5±1.5
	6	2437	1	17.6	16.5±1.5
	11	2462	1	17.6	16.5±1.5
802.11g	1	2412	6	17.1	16.5±1.5
	6	2437	6	17.4	16.5±1.5
	11	2462	6	17.8	16.5±1.5
802.11n(HT20)	1	2412	MCS0	17.0	16.5±1.5
	6	2437	MCS0	17.2	16.5±1.5
	11	2462	MCS0	17.5	16.5±1.5
802.11n(HT40)	3	2422	MCS0	15.9	16.5±1.5
	6	2437	MCS0	16.4	16.5±1.5
	9	2452	MCS0	16.2	16.5±1.5

WIFI Mode 2.4G(Sensor mode)

Mode	Channel number	Frequency (MHz)	Data rate (Mbps)	Average Output Power (dBm)	Average Tune up limited (dBm)
802.11b	1	2412	1	12.1	11.5±1.5
	6	2437	1	12.5	11.5±1.5
	11	2462	1	12.7	11.5±1.5
802.11g	1	2412	6	12.2	11.5±1.5
	6	2437	6	12.9	11.5±1.5
	11	2462	6	12.7	11.5±1.5
802.11n(HT20)	1	2412	MCS0	12.0	11.5±1.5
	6	2437	MCS0	12.7	11.5±1.5
	11	2462	MCS0	12.6	11.5±1.5
802.11n(HT40)	3	2422	MCS0	12.0	11.5±1.5
	6	2437	MCS0	12.4	11.5±1.5
	9	2452	MCS0	12.1	11.5±1.5

WIFI Mode (5G) (Normal mode)

Mode	Channel	Frequency (MHz)	Data rate (Mbps)	Conducted power [dBm]	Tune up limited (dBm)
11A	36	5180	6	15.72	15.0±1.5
	40	5200	6	15.49	15.0±1.5
	48	5240	6	15.20	15.0±1.5
	52	5260	6	15.09	14.5±1.5
	56	5280	6	15.01	14.5±1.5
	64	5320	6	14.77	14.5±1.5
	100	5500	6	8.48	8.0±1.5
	116	5580	6	8.30	8.0±1.5
	140	5700	6	8.39	8.0±1.5

Mode	Channel	Frequency (MHz)	Data rate (Mbps)	Conducted power [dBm]	Tune up limited (dBm)
	149	5745	6	13.87	13.5±1.5
	157	5785	6	13.50	13.5±1.5
	165	5825	6	13.95	13.5±1.5
11N20SISO	36	5180	MCS0	16.36	15.0±1.5
	40	5200	MCS0	16.23	15.0±1.5
	48	5240	MCS0	15.95	15.0±1.5
	52	5260	MCS0	15.91	14.5±1.5
	56	5280	MCS0	15.76	14.5±1.5
	64	5320	MCS0	15.63	14.5±1.5
	100	5500	MCS0	9.31	8.0±1.5
	116	5580	MCS0	9.07	8.0±1.5
	140	5700	MCS0	9.33	8.0±1.5
	149	5745	MCS0	14.72	13.5±1.5
	157	5785	MCS0	14.42	13.5±1.5
	165	5825	MCS0	14.78	13.5±1.5
11N40SISO	38	5190	MCS0	15.81	15.0±1.5
	46	5230	MCS0	15.36	15.0±1.5
	54	5270	MCS0	15.37	14.5±1.5
	62	5310	MCS0	15.10	14.5±1.5
	102	5510	MCS0	8.82	8.0±1.5
	110	5550	MCS0	8.74	8.0±1.5
	134	5670	MCS0	8.62	8.0±1.5
	151	5755	MCS0	14.04	13.5±1.5
	159	5795	MCS0	13.68	13.5±1.5
11AC20SISO	36	5180	MCS0	15.59	15.0±1.5
	40	5200	MCS0	15.31	15.0±1.5
	48	5240	MCS0	15.04	15.0±1.5
	52	5260	MCS0	15.05	14.5±1.5
	56	5280	MCS0	14.92	14.5±1.5
	64	5320	MCS0	14.66	14.5±1.5
	100	5500	MCS0	8.44	8.0±1.5
	116	5580	MCS0	8.15	8.0±1.5
	140	5700	MCS0	8.30	8.0±1.5
	149	5745	MCS0	13.73	13.5±1.5
	157	5785	MCS0	13.41	13.5±1.5
	165	5825	MCS0	13.85	13.5±1.5
11AC40SISO	38	5190	MCS0	15.87	15.0±1.5
	46	5230	MCS0	15.43	15.0±1.5
	54	5270	MCS0	15.41	14.5±1.5
	62	5310	MCS0	15.12	14.5±1.5
	102	5510	MCS0	8.86	8.0±1.5
	110	5550	MCS0	8.76	8.0±1.5
	134	5670	MCS0	8.66	8.0±1.5

Mode	Channel	Frequency (MHz)	Data rate (Mbps)	Conducted power [dBm]	Tune up limited (dBm)
	151	5755	MCS0	14.13	13.5±1.5
	159	5795	MCS0	13.74	13.5±1.5
11AC80SISO	42	5210	MCS0	14.76	15.0±1.5
	58	5290	MCS0	14.30	14.5±1.5
	106	5530	MCS0	7.74	8.0±1.5
	155	5775	MCS0	13.03	13.5±1.5

WIFI Mode (5G) (Sensor mode)

Mode	Channel	Frequency (MHz)	Data rate (Mbps)	Conducted power [dBm]	Tune up limited (dBm)
11A	36	5180	6	5.71	4.6±1.5
	40	5200	6	5.62	4.6±1.5
	48	5240	6	5.50	4.6±1.5
	52	5260	6	5.36	4.5±1.5
	56	5280	6	5.28	4.5±1.5
	64	5320	6	5.08	4.5±1.5
	100	5500	6	4.39	3.5±1.5
	116	5580	6	4.20	3.5±1.5
	140	5700	6	4.41	3.5±1.5
	149	5745	6	5.30	4.1±1.5
	157	5785	6	4.99	4.1±1.5
	165	5825	6	5.32	4.1±1.5
11N20SISO	36	5180	MCS0	5.59	4.6±1.5
	40	5200	MCS0	5.53	4.6±1.5
	48	5240	MCS0	5.39	4.6±1.5
	52	5260	MCS0	5.26	4.5±1.5
	56	5280	MCS0	5.18	4.5±1.5
	64	5320	MCS0	4.96	4.5±1.5
	100	5500	MCS0	4.22	3.5±1.5
	116	5580	MCS0	4.05	3.5±1.5
	140	5700	MCS0	4.26	3.5±1.5
	149	5745	MCS0	5.19	4.1±1.5
	157	5785	MCS0	4.87	4.1±1.5
	165	5825	MCS0	5.22	4.1±1.5
11N40SISO	38	5190	MCS0	6.07	4.6±1.5
	46	5230	MCS0	5.88	4.6±1.5
	54	5270	MCS0	5.76	4.5±1.5
	62	5310	MCS0	5.51	4.5±1.5
	102	5510	MCS0	4.70	3.5±1.5
	110	5550	MCS0	4.59	3.5±1.5
	134	5670	MCS0	4.45	3.5±1.5
	151	5755	MCS0	5.57	4.1±1.5
	159	5795	MCS0	5.24	4.1±1.5
11AC20SISO	36	5180	MCS0	5.66	4.6±1.5
	40	5200	MCS0	5.57	4.6±1.5
	48	5240	MCS0	5.46	4.6±1.5
	52	5260	MCS0	5.38	4.5±1.5
	56	5280	MCS0	5.30	4.5±1.5
	64	5320	MCS0	5.07	4.5±1.5
	100	5500	MCS0	4.24	3.5±1.5
	116	5580	MCS0	4.04	3.5±1.5
	140	5700	MCS0	4.24	3.5±1.5

Mode	Channel	Frequency (MHz)	Data rate (Mbps)	Conducted power [dBm]	Tune up limited (dBm)
	149	5745	MCS0	5.34	4.1±1.5
	157	5785	MCS0	5.01	4.1±1.5
	165	5825	MCS0	5.34	4.1±1.5
11AC40SISO	38	5190	MCS0	5.10	4.6±1.5
	46	5230	MCS0	4.85	4.6±1.5
	54	5270	MCS0	4.72	4.5±1.5
	62	5310	MCS0	4.42	4.5±1.5
	102	5510	MCS0	3.62	3.5±1.5
	110	5550	MCS0	3.57	3.5±1.5
	134	5670	MCS0	3.47	3.5±1.5
	151	5755	MCS0	4.77	4.1±1.5
	159	5795	MCS0	4.19	4.1±1.5
11AC80SISO	42	5210	MCS0	4.96	4.6±1.5
	58	5290	MCS0	4.42	4.5±1.5
	106	5530	MCS0	3.49	3.5±1.5
	155	5775	MCS0	4.62	4.1±1.5

13.2 SAR TEST RESULTS

Table 6: SAR Values

Test Position	Channel / Frequency (MHz)	Modulation Mode	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Drift ±0.21 dB	Limit SAR_{1g} 1.6 W/kg			SAR plot numbers in Annex C
					Drift (dB)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	
Test Position of body (Distance Between EUT and Flat Phatom:6mm)									
Rear Face	11/2462	OFDM	18.0	17.80	0.03	0.224	1.0471	0.235	N/A
Top Side	11/2462	OFDM	18.0	17.80	0.05	0.602	1.0471	0.630	N/A
Rear Face	11/2462	DSSS	18.0	17.60	0.06	0.213	1.0965	0.234	N/A
Top Side	11/2462	DSSS	18.0	17.60	0.02	0.576	1.0965	0.632	2.4G WIFI 11b_top Side_CH11
Rear Face	36/5180	OFDM	16.5	16.36	0.06	0.231	1.0328	0.239	N/A
Top Side	36/5180	OFDM	16.5	16.36	0.11	0.608	1.0328	0.628	5G WIFI_11N20_top Side_CH36
Rear Face	52/5260	OFDM	16.0	15.82	0.08	0.421	1.0423	0.439	N/A
Top Side	52/5260	OFDM	16.0	15.82	0.13	1.13	1.0423	1.178	5G WIFI_11N20_top Side_CH52
Rear Face	56/5280	OFDM	16.0	15.78	0.06	0.394	1.0520	0.414	N/A
Top Side	56/5280	OFDM	16.0	15.78	0.07	1.09	1.0520	1.147	N/A
Rear Face	100/5500	OFDM	9.5	9.31	0.08	0.122	1.0447	0.127	N/A
Top Side	100/5500	OFDM	9.5	9.31	0.15	0.924	1.0447	0.965	5G WIFI_11N20_top Side_CH100
Rear Face	140/5700	OFDM	9.5	9.33	0.08	0.113	1.0399	0.118	N/A
Top Side	140/5700	OFDM	9.5	9.33	0.12	0.406	1.0399	0.422	N/A
Rear Face	149/5745	OFDM	15.0	14.78	0.02	0.223	1.0520	0.235	N/A
Top Side	149/5745	OFDM	15.0	14.78	0.01	1.02	1.0520	1.073	5G WIFI_11N20_top Side_CH149
Rear Face	165/5825	OFDM	15.0	14.72	0.03	0.211	1.0666	0.225	N/A
Top Side	165/5825	OFDM	15.0	14.72	0.13	0.913	1.0666	0.974	N/A
Test Position of body (Distance Between EUT and Flat Phatom:0mm)									
Rear Face	6/2437	OFDM	13.0	12.90	0.05	0.133	1.0233	0.136	N/A
Top Side	6/2437	OFDM	13.0	12.90	-0.16	0.777	1.0233	0.795	N/A
Rear Face	11/2462	DSSS	13.0	12.70	0.06	0.221	1.0715	0.237	N/A
Top Side	11/2462	DSSS	13.0	12.70	0.10	0.845	1.0715	0.905	2G WIFI_11B_top Side_CH11
Rear Face	6/2437	DSSS	13.0	12.50	0.05	0.186	1.1220	0.209	N/A
Top Side	6/2437	DSSS	13.0	12.50	0.07	0.792	1.1220	0.889	N/A
Rear Face	38/5190	OFDM	6.1	6.07	0.09	0.075	1.0069	0.076	N/A
Top Side	38/5190	OFDM	6.1	6.07	0.12	0.246	1.0069	0.248	5G WIFI_11N40_top Side_CH38
Rear Face	54/5270	OFDM	6.0	5.76	0.09	0.214	1.0568	0.226	N/A

Top Side	54/5270	OFDM	6.0	5.76	0.08	0.515	1.0568	0.544	5G WIFI_11N40_top Side_CH54
Rear Face	102/5510	OFDM	5.0	4.70	-0.06	0.433	1.0715	0.464	N/A
Top Side	102/5510	OFDM	5.0	4.70	-0.09	1.07	1.0715	1.147	5G WIFI_11N40_top Side_CH102
Rear Face	110/5550	OFDM	5.0	4.59	0.05	0.485	1.0990	0.533	N/A
Top Side	110/5550	OFDM	5.0	4.59	0.12	1.01	1.0990	1.110	N/A
Rear Face	151/5750	OFDM	5.6	5.57	-0.08	0.232	1.0069	0.234	N/A
Top Side	151/5750	OFDM	5.6	5.57	-0.08	0.69	1.0069	0.695	5G WIFI_11N40_top Side_CH151

Note:

1. The value with blue color is the maximum SAR Value of each test band.
2. When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
3. When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

The EUT exercise program (provided by client) used during SAR testing was designed to exercise the various system components in a manner similar to a typical use. During the test, Channel and test mode software provided by the applicant was used to control the operating channel as well as the test mode. The worst case configuration is used in all specified testing.

Table 7: Measurement variability consideration

Test Position	Channel / Frequency (MHz)	Modulation Mode	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Drift ±0.21 dB	Limit SAR_{1g} 1.6 W/kg		
					Drift (dB)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)
Test Position of body (Distance Between EUT and Flat Phatom:6mm)								
Top Side	52/5260	OFDM	16.0	15.82	0.13	1.12	1.04	1.165
Top Side	56/5280	OFDM	16.0	15.78	0.07	1.06	1.05	1.113
Top Side	100/5500	OFDM	9.5	9.31	0.15	0.899	1.04	0.935
Top Side	149/5745	OFDM	15.0	14.78	0.01	0.978	1.05	1.027
Top Side	165/5825	OFDM	15.0	14.72	0.13	0.902	1.07	0.965
Test Position of body (Distance Between EUT and Flat Phatom:0mm)								
Top Side	11/2462	DSSS	13.0	12.70	0.10	0.797	1.07	0.853
Top Side	6/2437	DSSS	13.0	12.50	0.07	0.755	1.12	0.846
Top Side	102/5510	OFDM	5.0	4.70	-0.09	1.05	1.07	1.124
Top Side	110/5550	OFDM	5.0	4.59	0.12	1.00	1.10	1.100

According to KDB 865664 D01v01r04 section 2.8.1, repeated measurements are required following the procedures as below:

1. Repeated measurement is not required when the original highest measured SAR is < 0.80W/kg; steps 2) through 4) do not apply.
2. When the original highest measured SAR is ≥ 0.80 W/kg, 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 W/kg (~ 10% from the 1-g SAR limit).
4. Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

13.3 Simultaneous Transmission SAR Analysis.

EUT supports BT+2.4G WIFI and BT +5G WiFi simultaneous transmission. The 2.4G WIFI and 5G WiFi cannot transmit simultaneous.

According to KDB 447498 D01V06 Section 4.3.2 part B, The BT standalone SAR value estimated according the following exclusion criteria.

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]·[√f(GHz)/x] W/kg, for test separation distances ≤ 50 mm;
where x = 7.5 for 1-g SAR and x = 18.75 for 10-g SAR.

BT standalone SAR = 0.166W/kg(1-g SAR).
The Max Simultaneous Transmission = 0.166W/kg+1.178W/kg=1.344W/kg<1.6W/kg

EUT satisfies SAR simultaneous transmission exclusion requirement.

13.4 MAXIMUM GRAPH RESULTS

The graph results see ANNEX C.

14. Measurement Uncertainty

When the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

15. Main Test Instrument

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
SZ060-01	SAR Test System	SPEAG	DASY52 SAR TX90XL	F14/5YJ0B1/A/01	2024-03-18	1 year
SZ060-01-01	E-Field Probe	SPEAG	EX3DV4	7322	2024-03-26	1 year
SZ060-01-10	System Validation Dipole	SPEAG	D2450V2	966	2021-10-21	3 year
SZ060-01-12	System Validation Dipole	SPEAG	D5GHzV2	1218	2021-10-15	3 year
SZ060-01-13	Data Acquisition Unit	SPEAG	DAE4	1473	2024-03-18	1 year
SZ060-01-14	Dielectric Assessment Kit	SPEAG	DAKS 3.5	1056	N/A	N/A
SZ060-01-15	Vector Reflectometer	Copper Mountain Technologies	Planar R140	0090614	N/A	N/A
SZ060-01-16	Thermometer	LKM electronics GmbH	DTM3000	3477	2024-01-02	1 year
SZ060-01-17	Power Amplifier	Mini Circuits	ZHL-42W+	QA1449003	2024-05-01	1 year
SZ060-01-18	Power Amplifier	Mini Circuits	ZVE-8G+	111701437	2024-05-01	1 year
SZ060-01-21	ELI Phantom	SPEAG	ELI Phantom V6.0	2033	N/A	N/A
SZ180-13	MXG Vector Signal Generator	Keysight	N5182B	MY53051328	2023-09-25	1 year
SZ070-04	Directional Bridge	Agilent	86205A	MY31402141	2023-12-13	1 year
SZ182-02	RF Power Meter	Anritsu	ML2496A	1302005	2024-04-22	1 year
SZ182-03	Average power sensor	R&S	NRP-Z22	101689	2024-04-22	1 year
N/A	Device Holder	SPEAG	N/A	N/A	N/A	N/A

ANNEX A: Test Layout and Setup

Refer to “Appendix of 240530014SZN-005.pdf”.

ANNEX B: System Check Results

Refer to “Appendix of 240530014SZN-005.pdf”.

ANNEX C: MAXIMUM GRAPH RESULTS

Refer to “Appendix of 240530014SZN-005.pdf”.

ANNEX D: SYSTEM VALIDATION

Refer to “Appendix of 240530014SZN-005.pdf”.

ANNEX E: PROBE, DAE and DIPOLE CALIBRATION CERTIFICATE

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Client Intertek Certificate No: 24J02Z000079

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN : 7322
Calibration Procedure(s)	FF-Z11-004-02 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	March 26, 2024

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	12-Jun-23(CTTL, No.J23X05435)	Jun-24
Power sensor NRP-Z91	101547	12-Jun-23(CTTL, No.J23X05435)	Jun-24
Power sensor NRP-Z91	101548	12-Jun-23(CTTL, No.J23X05435)	Jun-24
Reference 10dBAttenuator	18N50W-10dB	19-Jan-23(CTTL, No.J23X00212)	Jan-25
Reference 20dBAttenuator	18N50W-20dB	19-Jan-23(CTTL, No.J23X00211)	Jan-25
Reference Probe EX3DV4	SN 3846	31-May-23(SPEAG, No.EX-3846_May23)	May-24
DAE4	SN 1555	24-Aug-23(SPEAG, No.DAE4-1555_Aug23)	Aug-24
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
SignalGenerator MG3700A	6201052605	12-Jun-23(CTTL, No.J23X05434)	Jun-24
Network Analyzer E5071C	MY46110673	25-Dec-23(CTTL, No.J23X13425)	Dec-24
Reference 10dBAttenuator	BT0520	11-May-23(CTTL, No.J23X04061)	May-25
Reference 20dBAttenuator	BT0267	11-May-23(CTTL, No.J23X04062)	May-25
OCP DAK-12	SN 1174	25-Oct-23(SPEAG, No.OCP-DAK12-1174_Oct23)	Oct-24

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Jun	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: March 29, 2024

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: 24J02Z000079 Page 1 of 9

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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i θ=0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016

c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below ConvF).
- *NORM(f)x,y,z = NORMx,y,z* frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- *Ax,y,z; Bx,y,z; Cx,y,z;VRx,y,z:*A,B,C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from±50MHz to±100MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:7322

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (*k*=2)
Norm(μV/(V/m)^2)[A]	0.46	0.57	0.54	±10.0%
DCP(mV)[B]	98.7	97.4	100.9	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (*k*=2)
0	CW	X	0.0	0.0	1.0	0.00	159.1	±2.2%
		Y	0.0	0.0	1.0		177.9	
		Z	0.0	0.0	1.0		176.2	

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor *k*=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X, Y, Z do not affect the E^2-field uncertainty inside TSL (see Page 4).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:7322

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	41.9	0.89	10.03	10.03	10.03	0.14	1.31	±12.7%
835	41.5	0.90	9.65	9.65	9.65	0.11	1.59	±12.7%
1750	40.1	1.37	8.30	8.30	8.30	0.23	1.06	±12.7%
1900	40.0	1.40	7.96	7.96	7.96	0.27	0.99	±12.7%
2300	39.5	1.67	7.64	7.64	7.64	0.65	0.65	±12.7%
2450	39.2	1.80	7.36	7.36	7.36	0.60	0.69	±12.7%
2600	39.0	1.96	7.10	7.10	7.10	0.41	0.90	±12.7%
5250	35.9	4.71	5.25	5.25	5.25	0.45	1.40	±13.9%
5600	35.5	5.07	4.65	4.65	4.65	0.55	1.20	±13.9%
5750	35.4	5.22	4.80	4.80	4.80	0.50	1.30	±13.9%

[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequency up to 6 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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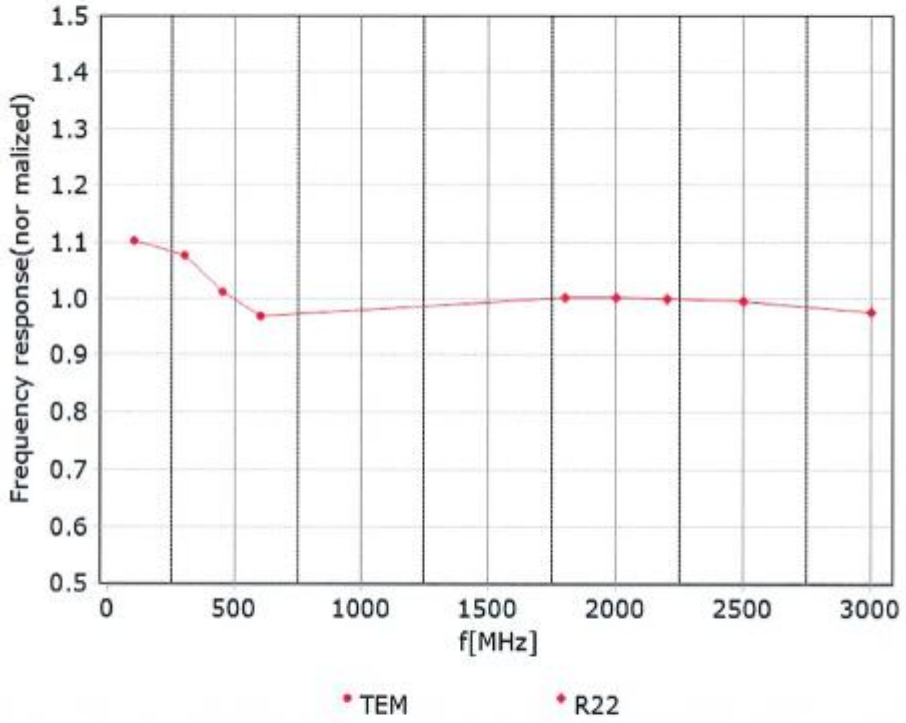
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.4% (*k*=2)

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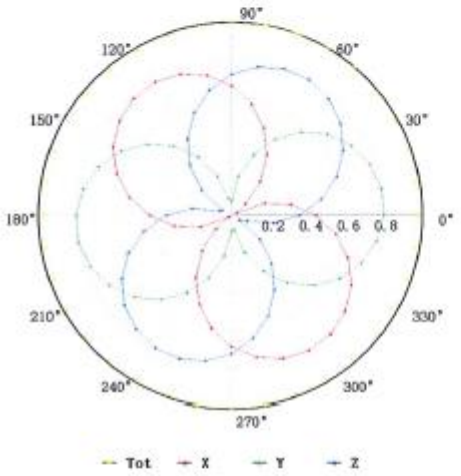
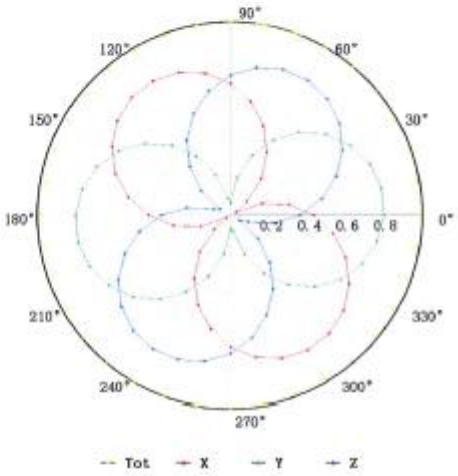
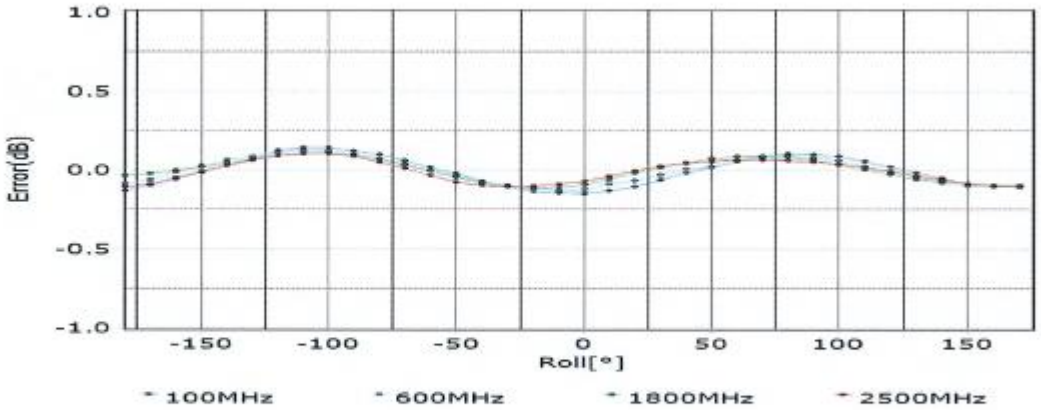
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





Uncertainty of Axial Isotropy Assessment: ±1.2% (*k*=2)

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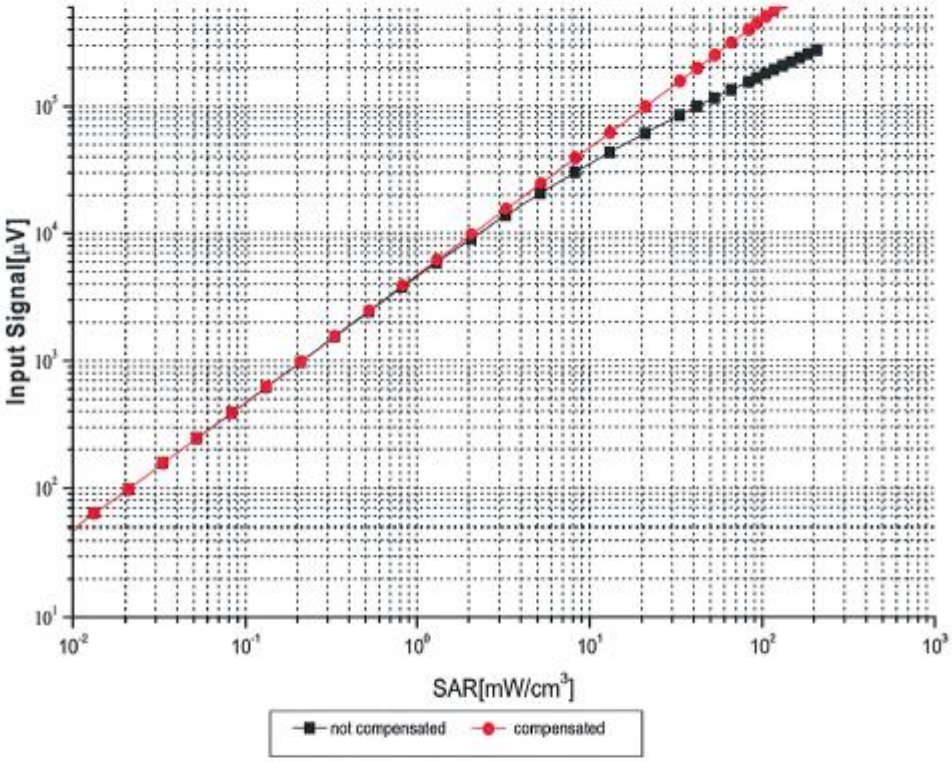
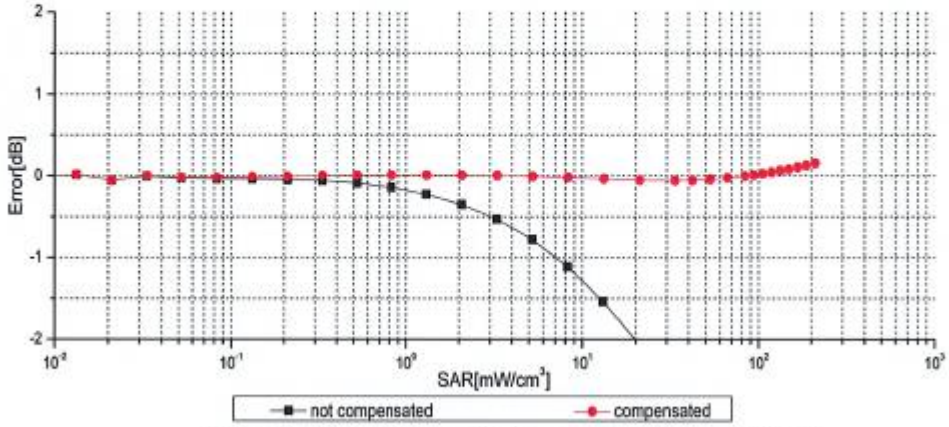
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





Uncertainty of Linearity Assessment: ±0.9% (*k*=2)

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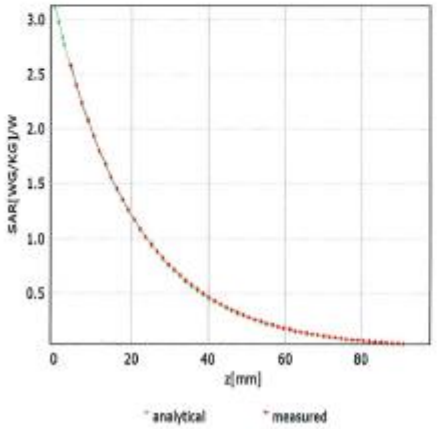
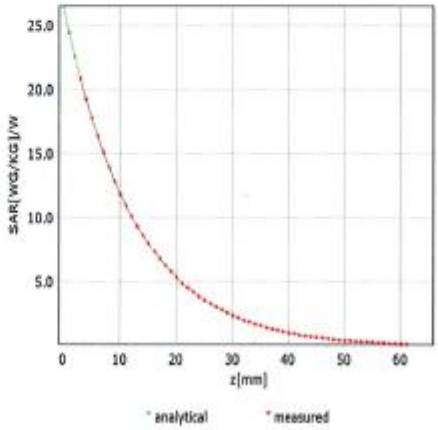
Conversion Factor Assessment

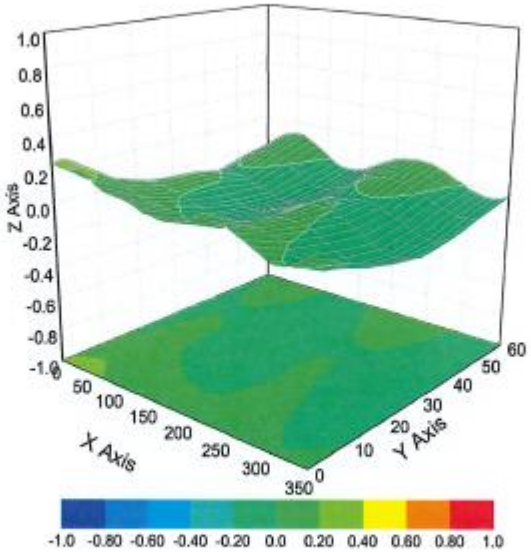
f=750 MHz,WGLS R9(H_convF)



f=1750 MHz,WGLS R22(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±3.2% (*k*=2)

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:7322

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	41.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

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Client : Intertek

Certificate No: 24J02Z000078

CALIBRATION CERTIFICATE

Object	DAE4 - SN: 1473
Calibration Procedure(s)	FF-Z11-002-01 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	March 18, 2024

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Process Calibrator 753	1971018	12-Jun-23 (CTTL, No.J23X05436)	Jun-24

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Jun	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: March 20, 2024

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Glossary:

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters:

- *DC Voltage Measurement*: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The report provide only calibration results for DAE, it does not contain other performance test results.

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DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV
Low Range: 1LSB = 61nV , full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.013 ± 0.15% (k=2)	404.606 ± 0.15% (k=2)	404.459 ± 0.15% (k=2)
Low Range	3.96391 ± 0.7% (k=2)	3.99545 ± 0.7% (k=2)	3.98870 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	346° ± 1 °

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Client Intertek Certificate No: Z21-60413

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 966
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	October 21, 2021

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Power sensor NRP8S	104291	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Reference Probe EX3DV4	SN 7517	03-Feb-21(CTTL-SPEAG,No.Z21-60001)	Feb-22
DAE4	SN 1556	15-Jan-21(SPEAG,No.DAE4-1556_Jan21)	Jan-22
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
NetworkAnalyzer E5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: October 27, 2021

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Client Intertek Certificate No: Z21-60413

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 966
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	October 21, 2021

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Power sensor NRP8S	104291	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Reference Probe EX3DV4	SN 7517	03-Feb-21(CTTL-SPEAG,No.Z21-60001)	Feb-22
DAE4	SN 1556	15-Jan-21(SPEAG,No.DAE4-1556_Jan21)	Jan-22
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
NetworkAnalyzer E5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: October 27, 2021

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.5 ± 6 %	1.81 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.4 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.98 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.9 W/kg ± 18.7 % (*k*=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.2Ω+ 3.04jΩ
Return Loss	- 26.0dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.064 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 10.21.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 966

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

Medium parameters used: f = 2450 MHz; σ = 1.809 S/m; ε_r = 39.51; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(7.34, 7.34, 7.34) @ 2450 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 107.2 V/m; Power Drift = 0.00 dB

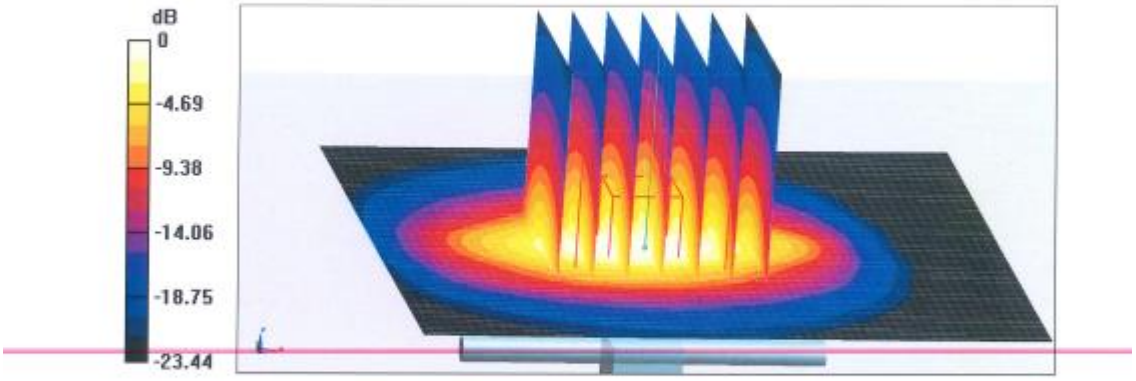
Peak SAR (extrapolated) = 27.7 W/kg

SAR(1 g) = 13.1 W/kg; SAR(10 g) = 5.98 W/kg

Smallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 46.9%

Maximum value of SAR (measured) = 22.3 W/kg



0 dB = 22.3 W/kg = 13.48 dBW/kg

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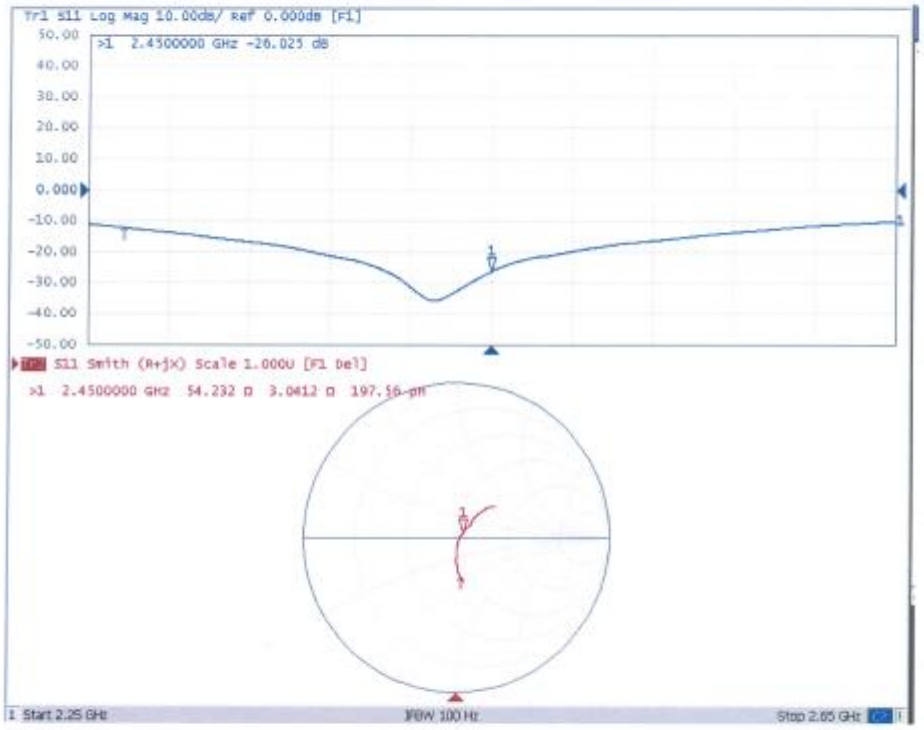
Impedance Measurement Plot for Head TSL



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Client Intertek Certificate No: Z21-60415

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1218
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	October 15, 2021

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Power sensor NRP8S	104291	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
ReferenceProbe EX3DV4	SN 3617	27-Jan-21(SPEAG,No.EX3-3617_Jan21)	Jan-22
DAE4	SN 1556	15-Jan-21(SPEAG,No.DAE4-1556_Jan21)	Jan-22
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
NetworkAnalyzerE5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: October 21, 2021

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: Z21-60415 Page 1 of 9

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.5 ± 6 %	4.59 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.67 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**76.4 W/kg ± 24.4 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.9 W/kg ± 24.2 % (*k*=2)**

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Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.3 ± 6 %	4.71 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.82 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**77.9 W/kg ± 24.4 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.25 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.4 W/kg ± 24.2 % (*k*=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.8 ± 6 %	5.04 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.3 W/kg ± 24.4 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.0 W/kg ± 24.2 % (*k*=2)**

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Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.5 ± 6 %	5.23 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.86 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**78.2 W/kg ± 24.4 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.24 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.3 W/kg ± 24.2 % (*k*=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	52.5Ω - 5.98jΩ
Return Loss	- 24.0dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	49.2Ω - 0.41jΩ
Return Loss	- 40.8dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	52.9Ω - 2.25jΩ
Return Loss	- 28.9dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	56.3Ω + 5.56jΩ
Return Loss	- 22.1dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.093 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

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DASY5 Validation Report for Head TSL Date: 10.15.2021
Test Laboratory: CTTL, Beijing, China
DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1218

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz,
Medium parameters used: f = 5200 MHz; σ = 4.589 S/m; ε_r = 35.48; ρ = 1000 kg/m^3, Medium parameters used: f = 5300 MHz; σ = 4.711 S/m; ε_r = 35.29; ρ = 1000 kg/m^3, Medium parameters used: f = 5600 MHz; σ = 5.041 S/m; ε_r = 34.82; ρ = 1000 kg/m^3, Medium parameters used: f = 5800 MHz; σ = 5.232 S/m; ε_r = 34.49; ρ = 1000 kg/m^3,
Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(5.5, 5.5, 5.5) @ 5200 MHz; ConvF(5.3, 5.3, 5.3) @ 5300 MHz; ConvF(5, 5, 5) @ 5600 MHz; ConvF(5.02, 5.02, 5.02) @ 5800 MHz; Calibrated: 2021-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Dipole Calibration /Pin=100mW, d=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.69 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 30.4 W/kg
SAR(1 g) = 7.67 W/kg; SAR(10 g) = 2.2 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 65.5%
Maximum value of SAR (measured) = 17.7 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 72.16 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 32.0 W/kg
SAR(1 g) = 7.82 W/kg; SAR(10 g) = 2.25 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 64.1%
Maximum value of SAR (measured) = 18.1 W/kg

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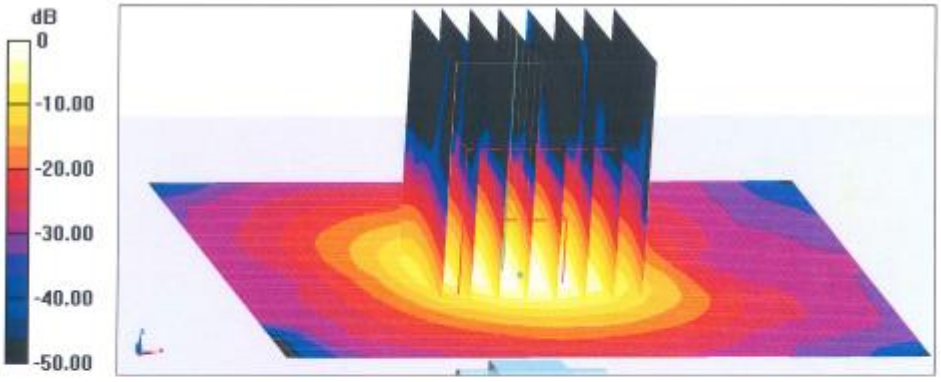
Dipole Calibration /Pin=100mW, d=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 70.99 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 35.2 W/kg
SAR(1 g) = 8.06 W/kg; SAR(10 g) = 2.31 W/kg
Smallest distance from peaks to all points 3 dB below = 7.5 mm
Ratio of SAR at M2 to SAR at M1 = 62.5%
Maximum value of SAR (measured) = 19.6 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.43 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 35.7 W/kg
SAR(1 g) = 7.86 W/kg; SAR(10 g) = 2.24 W/kg
Smallest distance from peaks to all points 3 dB below = 7.5 mm
Ratio of SAR at M2 to SAR at M1 = 61.2%
Maximum value of SAR (measured) = 19.4 W/kg



0 dB = 19.4 W/kg = 12.88 dBW/kg

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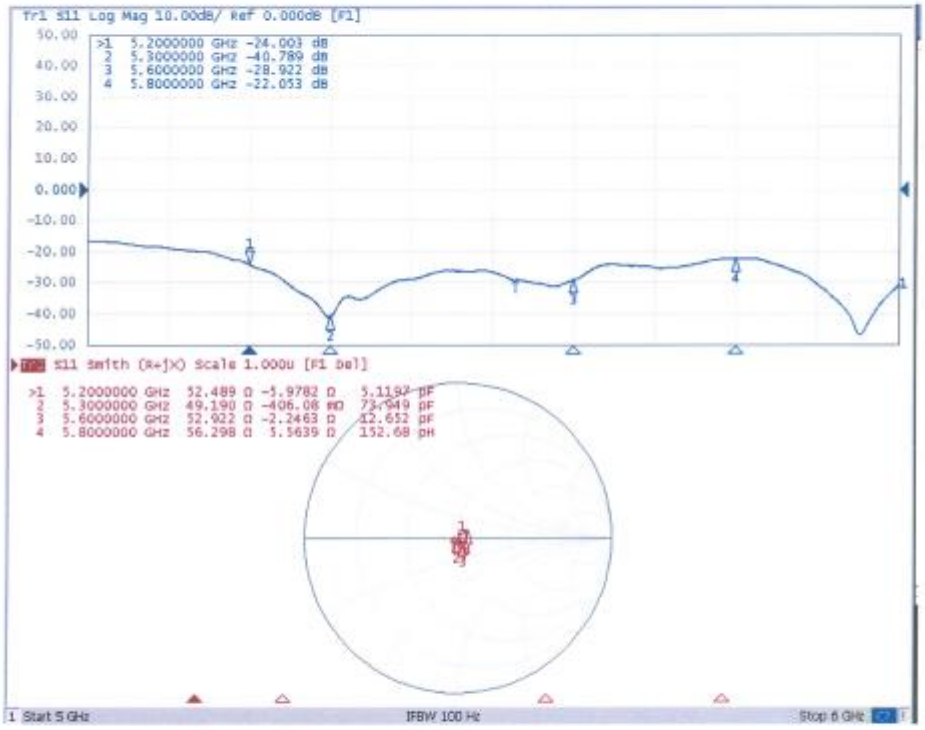
Impedance Measurement Plot for Head TSL



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**********End the Report**********