DEKRA Testing and Certification, S.A.U.
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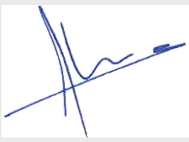
C.I.F. A29 507 456

DEKRA

Test report No:
NIE: 77562RAN.002

Partial Test report
IEEE Std 1528™-2013

(*) Identification of item tested	SC2324
(*) Trademark	Sepura
(*) Model and /or type reference tested	SC2324
(*) Other identification of the product	FCC ID: XX6SC2324X IC: 8739A-SC2324X HW version : PLX-2116505-02 (mod state 12) SW version : 1807 018 07367
(*) Features	TETRA, GNSS
Manufacturer	Sepura Limited 9000 Cambridge Research Park, Waterbeach, Cambridge CB25 9TL, UK
Test method requested, standard	1. IEEE Std 1528™-2013. 2. FCC 47 CFR Part 2.1093.
Summary	The maximum 1g volume averaged SAR found in the spot check has been 3.220 W/kg, for TETRA mode. See remarks and comments section and Appendix A:Test results for more details.
Approved by (name / position & signature)	Miguel Lacave Antennas Lab Manager  2024.05.17 11:20:57 +02'00'
Date of issue	2024-05-16
Report template No	FAN44_00 (*) "Data provided by the client"

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Competences and guarantees

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1. This report is only referred to the item that has undergone the test.
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Uncertainty

Uncertainty (factor k=2) was calculated according to the following documents:

1. DEKRA Testing and Certification S.A.U. internal document PODT000.
2. FCC OET KDB 865664 D01 - SAR Measurement Requirements for 100 MHz to 6 GHz v01r04 (August 2015).

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested", “Other identification of the product”, “Features” and “Test sample description”).

2. Normal use conditions and testing distance information.

3. Model SC2324 has been declared by the supplier of the sample as being the same as the model SC2024 tested in the SAR test report 73396RAN.004A1 but without the BT/WiFi module (see manufacturer declaration below). A spot check has been performed on the SC2324 model based on SAR worst-cases results obtained from the full tested model SC2024.

Sepura Restricted

13 March 2024

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Beach Drive, Waterbeach,
Cambridge CB25 9TL UK

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www.sepura.com

Declaration of different variants of SC2024 and SC2324 series.

There are three variants:

SC2024 with Bluetooth/WLAN module.

SC2024 without Bluetooth/WLAN module.

SC2324 without Bluetooth/WLAN module.

The SC2024 is provided with a full keymat. The SC2324 is provided with a reduced key mat and associated bezel. All three variants share the same main PCB. The Bluetooth/WLAN module is a separate module that plugs into the main PCB.

The SC2024 without Bluetooth/WLAN module is a subset of the SC2024 with Bluetooth/WLAN module, with the Bluetooth/WLAN module removed.

The SC2324 without Bluetooth/WLAN module is a subset of the SC2024 with Bluetooth/WLAN module, with the Bluetooth/WLAN module removed and a reduced key mat and associated bezel.

Signed on behalf of Sepura Limited:

Company Officer:	Chris Beecham
Telephone Number:	+44 (01223) 876000
Email:	Chris.Beecham@sepura.com
Position:	Conformance Engineer

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We invest in people Silver

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: the client

Samples are composed of the following elements:

Sample	Control Nº	Description	Model	Serial Nº	Date of reception
S/01	76622/006	Sepura TETRA radio	SC2324	1PR002331GKK6W3	2023-09-07
S/01	73291/008	Battery	300-01853	1D000000FC4E513D	2022-09-28
S/02	76622/006	Sepura TETRA radio	SC2324	1PR002331GKK6W3	2023-09-07
S/02	73291/008	Battery	300-01853	1D000000FC4E513D	2022-09-28
S/02	73291/019	Battery	300-01852	04000000BCA1693D	2022-09-28
S/02	73396/021	Antenna	300-00663	--	2023-01-16

1. Sample S/01 has undergone the test(s) specified in subclause “Test method requested”: Conducted average output power.
2. Sample S/02 has undergone the test(s) specified in subclause “Test method requested”: SAR evaluation for TETRA mode.

Test sample description

Description of product ...:	TETRA portable radio		
Software version........:	1807 018 07367		
Hardware version........:	PLX-2116505-02 (mod state 12)		
Mounting position.......:	[ ]	Table top equipment	
	[ ]	Wall/Ceiling mounted equipment	
	[X]	Equipment used next to the ear	
	[X]	Hand-held equipment	
	[X]	Other: Body worn	
Accessories (not part of the test item) ....:	**Description**	**Type**	**Model**
	14 Wh Battery	Battery	300-01853
	8.6 Wh Battery	Battery	300-01852
	UHF ¼ wave whip Antenna	Antenna	300-00499
	UHF ¼ wave whip Antenna	Antenna	300-00663
	UHF ¼ wave whip Antenna	Antenna	300-01032
	Extended Belt Loop	Carrying accessory	300-00912
	Lightweight Leather Case with Belt Clip	Carrying accessory	300-01385
	Heavy Duty Case with Klick Fast Stud	Carrying accessory	300-01386
	Nylon Holster	Carrying accessory	300-01387
	Belt Clip	Carrying accessory	300-01589
	Klickfast Stud	Carrying accessory	300-00718
	Klickfast Belt Dock (50 cm)	Carrying accessory	300-00322
	Klickfast Belt Dock (60 cm)	Carrying accessory	300-00323
	Standard Remote Speaker Microphone (RSM)	Audio Accessory	300-00389
	Advanced Remote Speaker Microphone (RSM) (37 cm Lead)	Audio Accessory	300-00734
	Advanced Remote Speaker Microphone (RSM) (60 cm Lead)	Audio Accessory	300-00733
	IP67 sRSM Speaker Microphone (Standard Lead Length)	Audio Accessory	300-01169
	IP67 sRSM Speaker Microphone (Short Lead Length)	Audio Accessory	300-01982
	IP67 Ultra CSM (with Heavy Duty Large Clip)	Audio Accessory	300-01123
	IP67 Ultra CSM Peltor Interface (with Heavy Duty Large Clip)	Audio Accessory	300-01152
	IP67 Ultra RSM (with Heavy Duty Large Clip)	Audio Accessory	300-01124
	IP67 Ultra RSM Peltor Interface (with Heavy Duty Large Clip)	Audio Accessory	300-01153
	m-RSM – Mini Remote Speaker Microphone	Audio Accessory	300-01979
	EM2 Ear Hanger, RAC (50 cm)	Audio Accessory	300-00579
	EM2 Ear Hanger, RAC (90 cm)	Audio Accessory	300-00580
	EM2 Ear Hanger, RSM (50 cm)	Audio Accessory	300-00581
	EH6 Ear Hanger, RAC (50 cm)	Audio Accessory	300-00562
	EH6 Ear Hanger, RAC (90 cm)	Audio Accessory	300-00563
	EH6 Ear Hanger, RSM	Audio Accessory	300-00564
	STP In-Ear Tactical Headset (RAC)	Audio Accessory	300-00746
	STP Genesis II Headset (RAC)	Audio Accessory	300-00747
	RAC Two-Wire Kit: G-Type Ear Hanger	Audio Accessory	300-01626
	RAC Two-Wire Kit: Acoustic Tube Ear Hanger	Audio Accessory	300-01628
	STP/SC2 RAC One-Wire Kit, Acoustic Tube Ear Hanger	Audio Accessory	300-02017

	Heavy-Duty Headset	Audio Accessory	300-00852
	Heavy-Duty Helmut Headset	Audio Accessory	300-00850
	GSM-Style In-Line Hands-Free Kit (RAC)	Audio Accessory	300-00428
	Two-Wire Kit (RAC)	Audio Accessory	300-00755

Identification of the client

Sepura Limited

9000 Cambridge Research Park, Waterbeach, Cambridge CB25 9TL, UK

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2024-04-29
Date (finish)	2024-05-03

Document history

Report number	Date	Description
77562RAN.002	2024-05-03	First release

Environmental conditions

Date	Max. Temp. ºC	Min. Temp. ºC	Max. Hum. %	Min. Hum. %	Limit
From 2024-04-29 to 2024-05-03	23.20	21.30	52.42	30.06	18-25 ºC, 30-70%

Remarks and comments

1. As mentioned in the KDB 178919 D01, a spot check has been performed on the SC2324 model based on SAR worst-cases results obtained from the full tested model SC2024, which results are stated in SAR test report 73396RAN.004A1.
2. As mentioned in the FCC KDB 484596 D01v02r03, a spot checking has been approved through FCC inquiry.
3. The tests have been performed by the technical personnel: Ismael Gamarro.
4. The instrumentation utilized to perform the tests covered in this test report is listed in the following table:

DEKRA Control Number	Equipment	S/N
01084	Dual directional coupler, HP model 778D	15821
03485	Power amplifier, MITEQ model AMF-4D-00400600-50-30P	1456425
04482	Vector Network Analyzer, Agilent Technologies model N9923A FieldFox	US49470126
03436	Robot controller, Stäubli model CS7MB	F04/50P5A1/C/01
02402	20 dB Attenuator, WEINSCHEL model 75A-20-11	902
03420	Robot, Stäubli model RX60BL	F04/SOP5A1/A/01
03438	Head Tissue Equivalent Liquid for 450 MHz band, SPEAG model HSL450V2	391
05580	Dipole Validation kit 450MHz, SPEAG model D450V3	D450V3-SN:1092
03430	Data acquisition device, SPEAG model DAE4	669
04393	Dual Power meter, Agilent model E4419B	MY45103349
06125	Dosimetric E-field Probe, SPEAG model EX3DV4	7461
05581	Head Tissue Equivalent Liquid for 450 MHz band, SPEAG model HSL450V2	-
03424	Mounting Device for Hand-held devices, SPEAG model SD000 HD1 HA	-
04164	Power Sensor 50 MHz-18GHz, R&S model NRP-Z81	100527
04392	Power sensor, Agilent model E9300A	SG41491189
04391	Power sensor, Agilent model E9300A	SG41491203
03847	Measurement server, SPEAG model DASY5 SE UMS 011 BS	1227
03346	Signal RF Generator, R&S model SMU200A	102234
03422	SAM head-body simulator, SPEAG model TWIN SAM V4.0	-
04859	DAK software, SPEAG model DAK V1.10.325.10	-
03423	SAR measurement software, SPEAG model DASY52	-
03453	Temperature and humidity probe, Pico Technology model HUMIDIPROBE	UAL02/077
04170	Digital thermometer, LKM Electronics model DTM3000-Spezial	2989
03267	Vector Network Analyzer, Agilent Technologies model E5071C	MY46104904
04171	Dielectric probe kit, SPEAG model DAK-3.5	1080

5. References

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093 and the following FCC Published RF exposure KDB procedures:

- FCC OET KDB 447498 D01 General RF Exposure Guidance v06 (October 2015).
- FCC OET KDB 865664 D01 - SAR Measurement Requirements for 100 MHz to 6 GHz v01r04 (August 2015).
- FCC OET KDB 643646 D01: SAR test for PTT Radios v01r03
- FCC OET KDB 178919 D01 178919 D01 Permissive Change Policy v06
- FCC KDB 484596 D01 Referencing Test Data v02r03

Testing verdicts

Not applicable :	N/A
Pass :	P
Fail :	F
Not measured :	N/M

Summary

Council Recommendation 1999/519/EC. Annex II h	VERDICT			
	N/A	P	F	N/M
TETRA 450-470 MHz		P[1]		
1: The partial measurements over the SC2324 pass the standards'limits, and additionally, the SAR measurements for the SC2324 are lower than those for SC2024 and are in the uncertainty range of the laboratory.				

Appendix A: Test configuration

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1. GENERAL INTRODUCTION

1.1. Application Standard

The Federal Communications Commission (FCC) sets the limits for General Population/Uncontrolled exposure to radio frequency electromagnetic fields for transmitting devices designed to be used within 20 centimetres of the body of the user under FCC 47 CFR Part 2.1093 - "Radiofrequency radiation exposure evaluation: portable devices", paragraph (d)(2).

1.2. General requirements

The SAR measurement has been performed continuing the following considerations and environment conditions:

The ambient temperature shall be in the range of 18ºC to 25ºC and the variation shall not exceed +/-2ºC during the test.

The ambient humidity shall be in the range of and 30% - 70%.

The device battery shall be fully charged before each measurement.

1.3. Measurement system requirements

The measurement system used for SAR tests fulfills the procedural and technical requirements described at the reference standards used.

1.4. Phantom requirements

The phantom model for head measurements is a simplified representation of the human anatomy and comprised of material with electrical properties similar to the corresponding tissues in human body. The human model has the following proportions:

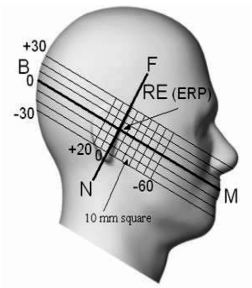


Figure 1: Proportions of Phantom

The shell model is a shaped container and it has the representation shown in the following figure:

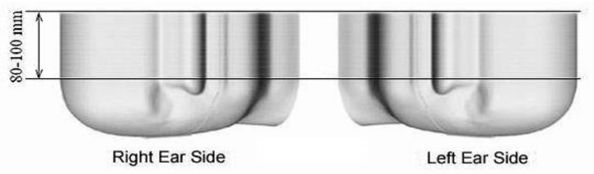


Figure 2: Proportions and shape of Phantom shell

The phantom model for body measurements is an elliptical open-top container with a flat bottom, with the following shape and dimensions:

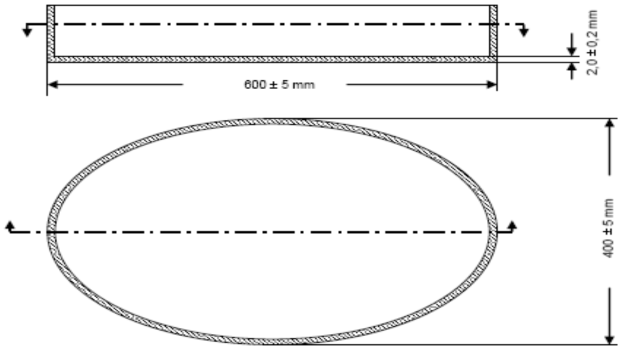


Figure 3: Proportions and shape of Phantom shell

1.5. Measurement Liquids requirements

The liquids used to simulate the human tissues, must fulfill the requirements of the dielectric properties required. These target dielectric properties are indicated into FCC OET KDB 865664 D01 Appendix A.

Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

Table 1: Liquid material requirements

To minimize the effect of reflections on peak spatial-average SAR values, from the upper surface of the tissue equivalent liquid, the depth of the liquid should be at least 15 cm.

Dielectric porperties values of the Tissue Simulant Liquids used for SAR measurements are included in Appendix B, Section 3, of this document.

2. MEASUREMENT SYSTEM

2.1. Measurement System

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

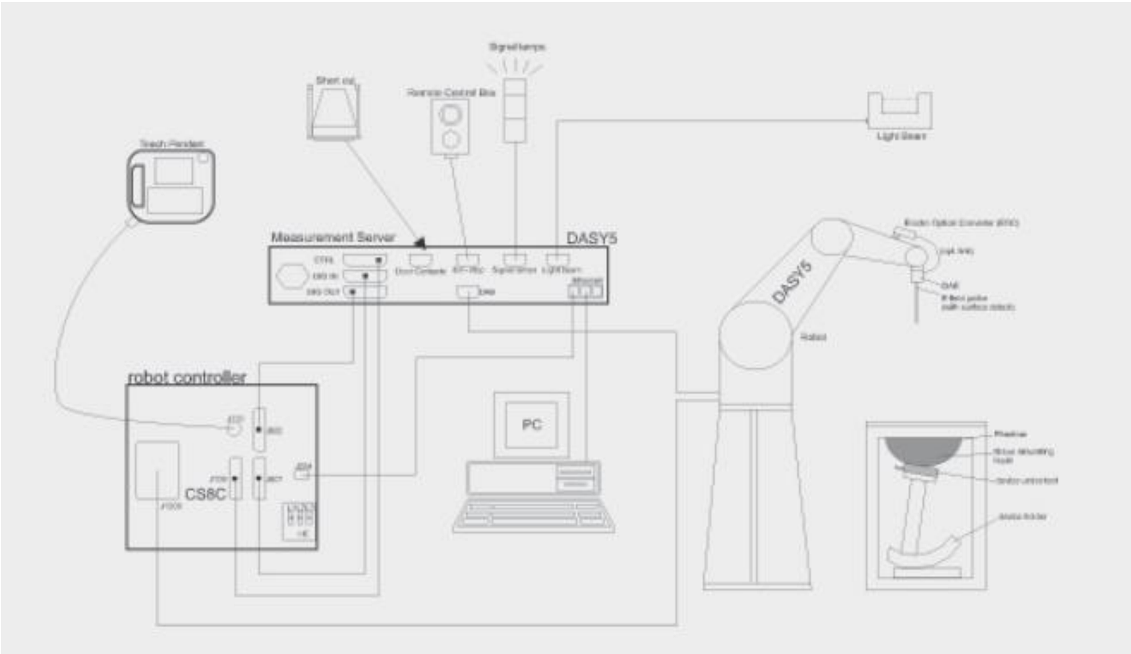


Figure 4: SAR Measurement system

- 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 the DASY 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.

	Model	**EX3DV4**
	**Construction**	Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).
	Frequency	10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 6 GHz)
	Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)
	Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
	Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1.0 mm

	Model	**DAE4**
	**Construction**	Signal amplifier, multiplexer, A/D converter, and control logic. Serial optical link communication with DASY4/5 embedded system (fully remote controlled). Two-step probe touch detector for mechanical surface detection and emergency robot stop.
	Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)
	Input Offset Voltage	< 5 µV (with auto zero)
	Input Resistance	200 MOhm
	Input Blas Current	< 50 fA

	Model	**Twin SAM**
	**Construction**	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.
	Material	Vinylester, glass fiber reinforced (VE-GF)
	Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)
	Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)
	Dimensions	Length: 1000 mm Width: 500 mm Height: adjustable feet
	Filling Volume	Approx. 25 liters
	Wooden Support	SPEAG standard phantom table

	Model	Mounting Device for Hand-Held Transmitters
	Construction	In combination with the Twin SAM V5.0/V5.0c or ELI Phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).
	Material	Polyoxymethylene (POM)

	Model	System Validations Kits 450 MHz – 6 GHz
	Construction	Symmetrical dipole with l/4 balun. Enables measurement of feedpoint impedance with NWA. Matched for use near flat phantoms filled with tissue simulating solutions.
	Frequency	450 MHz to 5800 MHz
	Return Loss	20 dB at specified validation position
	Dimensions (length and overall height in mm)	

Product	Dipole length	Overall height
D450V3	290.0	330.0
D750V3	179.0	330.0
D900V2	148.5	340.0
D1800V2	72.5	300.0
D2000V2	65.0	300.0
D2300V2	56.3	290.0
D2450V2	52.0	290.0
D2600V2	49.2	290.0
D3300V2	38.0	285.0
D3500V2	37.0	285.0
D3700V2	34.7	285.0
D3900V2	32.0	280.0
D4200V2	30.1	280.0
D4600V2	27.0	280.0
D4900V2	25.0	280.0
D5GHzV2	20.6	300.0

2.2. Device Holder

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 in 5mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ±20%. An 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 different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation centre for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity ε=3 and loss tangent δ=0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

2.3. Test Positions of device relative to head

The reference standard requires two test positions for the handset in the head. These positions are the "cheek" position and the “tilted” position. The tests positions used are described below. The handset should be tested in both positions (left and right sides) in the SAM phantom.

The DUT shall be placed in the Phantom in such way that the main point of the mobile terminal (acoustic output) coincides with the reference point located at the Phantom’s ear.

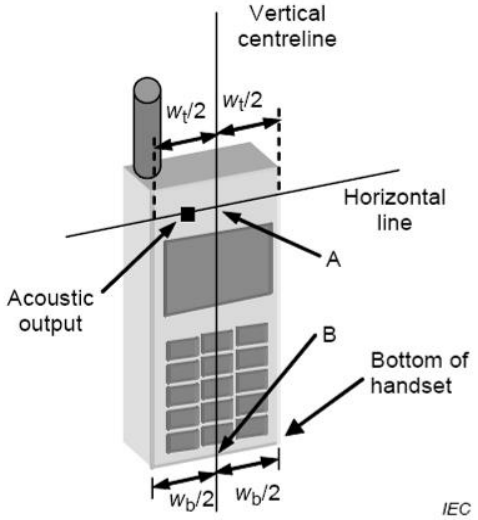


Figure 5: DUT’s basic scheme

SAR measurements will be performed for the following configurations as indicated in the reference standard:

- Right side of Phantom, Cheek position.
- Right side of Phantom, 15º Tilted position.
- Left side of Phantom, Cheek position.
- Left side of Phantom, 15º Tilted position.

Definition of the “cheek” position

The "cheek" position relative to Phantom is described as follows:

1. - Position the device with the vertical centre line of the body of the device and the horizontal line crossing the centre of the ear piece in a plane parallel to the sagital plane of the Phantom. While maintaining the device in this plane, align the centre line with the reference plane containing the three ear and mouth reference points (M, RE and LE).

2. - Translate the mobile phone box towards the Phantom until the ear-piece touches the ear reference point (RE or LE). While maintaining the device in the reference plane, move the bottom of the box until any point of the front side is in contact with the cheek of the Phantom.

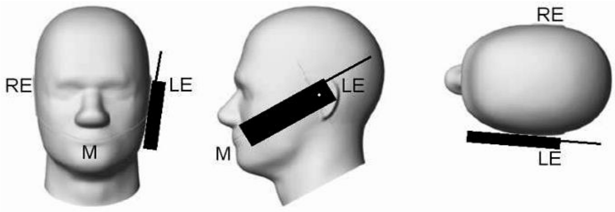


Figure 6: “Cheek” position of DUT

Definition of the tilted position:

The "15º tilted" position relative to Phantom is described as follows:

1. - Position the device in the “cheek” position described above.

2. - While maintaining the device in the reference plane described above and pivoting against the ear, move it outward away from the mouth by an angle of 15 degrees.

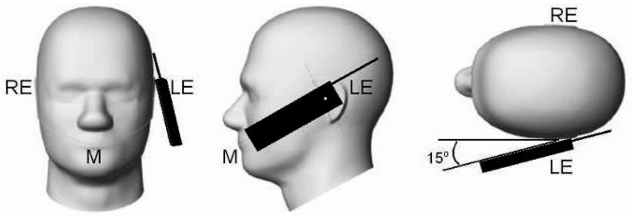


Figure 7: “Tilted” position of DUT

If the mobile phone is also designed to transmit with other configurations (antenna fully extended/retracted, keypad cover opened/closed…), all tests described above shall be performed for each configuration. When considering multi-mode and multi-band mobile phones, all of the above tests shall be performed at each transmitting mode/band with the corresponding maximum peak power level

If the device under test is a two-way radio the device shall be positioned at the distance to the phantom surface that corresponds to the intended use as specified by the manufacturer in the user instructions. If the intended use is not specified, a separation distance of 25 mm between the phantom surface and the device shall be used for SAR measurements.

2.4. Test Positions of device relative to body

Handheld PTT two-ways radios shall be tested for body-worn accessory exposure conditions according to KDB 643646 D01.

The device has been tested in the following test positions to be in compliance with this possible body-worn device operation at a minimum test distance of 5 mm:

- Back Face: DUT placed at the centre of flat phantom with its back side against the flat phantom surface.
- Front Face: DUT placed at the centre of flat phantom with its front side against the flat phantom surface.

As the device under test may be use with several types of accessories, antennas, audio Accessory and carrying accessories, Body-worn exposure conditions has been tested for each worst combination of accessories at 0mm distance to the flat phantom.

2.5. Test to be performed

Test has been performed on each worst-case exposure condition, head, body and front of face, using the position where the maximum SAR has been found in the fully tested SC2024 model.

Measured positions have been:

- Measurements for head exposure condition:
  - SAR measurement at the left side of the Phantom in cheek and tilted 15º positions of the DUT.

- Measurements for front of face exposure condition:
  - SAR measurement at the center side of the Phantom at 25 mm for the front-of-face use.

- Measurements for body exposure condition:
  - SAR measurement with front face of the DUT with a separation distance of 5 mm from the phantom.

2.6. Description of interpolation/extrapolation scheme

The local SAR inside the Phantom is measured using small dipole sensing elements inside a probe element. The probe tip must not be in contact with the Phantoms surface in order to minimise measurement errors, but the highest local SAR is obtained from measurements at a certain distances from the shell trough extrapolation. The accurate assessment of the maximum SAR averaged over 10 gr. requires a very fine resolution in the three dimensional scanned data array. Since the measurements have to be performed over a limited time, the measured data have to be interpolated to provide an array of sufficient resolution.

The interpolation of 2D area scan is used after the initial area scan, at a fixed distance from the Phantom shell wall. The initial scan data is collected with approx. 15 mm spatial resolution and this interpolation is used to find the location of the local maximum for positioning the subsequent 3D scanning within a 1mm resolution.

For the 3D scan, data is collected on a spatially regular 3D grid having 5 mm steps in both directions. After the data collection by the SAR probe, the data are extrapolated in the depth direction to assign values to points in the 3D array closer to the shell wall. A notional extrapolation value is also assigned to the first point outside the shell wall so that subsequent interpolation schemes will be applicable right up to the shell wall boundary.

2.7. Determination of the largest peak spatial-average SAR

To determine the maximum value of the peak spatial-average SAR of a DUT, all device positions, configurations and operational modes should be tested for each frequency band.

The averaging volume shall be chosen as 1gr. of contiguous tissue. The cubic volumes, over which the SAR measurements are averaged after extrapolation and interpolation, are chosen in order to include the highest values of local SAR.

The maximum SAR level for the DUT will be the maximum level obtained of the performed measurements indicated in the previous points.

2.8. System Check

Prior to the SAR measurements, system verification is done to verify the system accuracy. As IEEE 1528-2013, Annex paragraph 8.2.1 “System Check - Purpose” specifies, a complete SAR evaluation is done using a half-wavelength dipole as source with the frequency of the mid-band channel of the operating band, or within 10% of this channel, whichever is greater.

The measured 1 gr. and 10 gr. SAR should be within 10% of the expected target values specified in the calibration certificate of the dipole, for the specific tissue and frequency used.

3. UNCERTAINTY

According to FCC OET KDB 865664 D01, if the highest measured 1-g SAR is < 1.5 W/kg, SAR measurement uncertainty analysis is not required to be included into SAR report, but it has been included for ISO 17025 accreditation.

Uncertainty for 300 MHz – 3 GHz

ERROR SOURCES (source of uncertainty)	**Uncertainty value (%)**	**Prob. Dist.**	**Div.**	***ci (1g)***	***ci (10g)***	***Standard uncertainty (1g) (%)***	***Standard uncertainty (10g) (%)***
Measurement Equipment							
Probe Calibration	13.30%	N	2	1	1	6.65%	6.65%
Probe calibration drift	1.70%	R	√3	1	1	0.98%	0.98%
Axial Isotropy	4.70%	R	√3	0.7	0.7	1.90%	1.90%
Hemisferical Isotropy	9.60%	R	√3	0.7	0.7	3.88%	3.88%
Boundary effect	1.00%	R	√3	1	1	0.58%	0.58%
Linearity	4.70%	R	√3	1	1	2.71%	2.71%
System Detection limits	0.25%	R	√3	1	1	0.14%	0.14%
Probe modulation response	4.80%	N	1	1	1	4.80%	4.80%
Readout electronics	0.30%	N	1	1	1	0.30%	0.30%
Response time	1.01%	R	√3	1	1	0.58%	0.58%
Integration time	2.60%	R	√3	1	1	1.50%	1.50%
RF Ambient noise	3.00%	R	√3	1	1	1.73%	1.73%
RF Ambient reflections	3.00%	R	√3	1	1	1.73%	1.73%
Probe positioner mech. restrictions	0.40%	R	√3	1	1	0.23%	0.23%
Probe positioning with respect to phantom shell	2.90%	R	√3	1	1	1.67%	1.67%
Max. SAR Eval.	2.00%	R	√3	1	1	1.15%	1.15%
Test Sample Related							
Device holder uncertainty	3.60%	N	1	1	1	3.60%	3.60%
Test sample positioning	2.90%	N	1	1	1	2.90%	2.90%
Drift of output power	2.50%	N	1	1	1	2.50%	2.50%
System Validation source (dipole)							
Deviation of experimental dipole from numerical dipole	0.00%	N	1	0	0	0.00%	0.00%
Input power and SAR drift measurement	2.00%	R	√3	1	1	1.15%	1.15%
Dipole axis to liquid distance	3.40%	R	√3	1	1	1.96%	1.96%
Phantom and Setup							
Phantom uncertainty (shape and thickness tolerances)	6.10%	R	√3	1	1	3.52%	3.52%
Algorithm for correcting SAR for deviations in permittivity and conductivity	1.90%	N	1	1	0.84	1.90%	1.60%
Liquid conductivity (meas.)	3.57%	N	1	0.78	0.71	2.79%	2.54%
Liquid permittivity (meas.)	3.57%	N	1	0.26	0.26	0.93%	0.93%
Liquid conductivity – temperature uncertainty	2.30%	R	√3	0.78	0.71	1.04%	0.94%
Liquid permittivity – temperature uncertainty	0.36%	R	√3	0.23	0.26	0.05%	0.05%
Combined standard uncertainty (Validation antenna)	$u_c = \sqrt{\sum_{1=1}^{m} c_i^2 \cdot u_i^2}$					9.88%	9.75%
Expanded uncertainty (confidence interval of 95%)	*ue =2.00 uc*					**19.77%**	**19.51%**
Combined standard uncertainty (DUT)	$u_c = \sqrt{\sum_{1=1}^{m} c_i^2 \cdot u_i^2}$					12.68%	12.58%
Expanded uncertainty (confidence interval of 95%)	*ue =2.00 uc*					**25.36%**	**25.16%**

Table 2: Uncertainty Assessment for 300 MHz - 3 GHz.

4. SAR LIMIT

Having a worst-case measurement, the SAR limit is valid for general population/uncontrolled exposure.

The SAR values have to be averaged over a mass of 1 gr. (SAR 1 gr.) with the shape of a cube and averaged over a mass of 10 gr (Extremity SAR 10 gr). These levels could not exceed the values indicated in the application Standard:

Standard	Exposure	SAR	SAR Limit (W/kg)
FCC 47 CFR Part 1.1310, Paragraph (c)	Ocupational/Controlled	SAR 1-g.	8.0
FCC 47 CFR Part 1.1310, Paragraph (c)	Ocupational/Controlled Extremity	SAR 10-g.	20.0

Table 3: SAR limit

5. DEVICE UNDER TEST

5.1. Dimensions

Dimensions	Millimetres
Width x Height x Depth	Width: 61mm, Height: 139mm (excluding antenna and rotary) and Depth: 75mm (standard battery)
Overall Diagonal:	145.0
Display Diagonal:	75.0

Table 4: DUT dimensions

5.2. Wireless Technology

Wireless Technology	Frequency Bands	Modes	Duty Cycle used for SAR testing
TETRA	450-470 MHz	TETRA	22.69 %

Table 5: Supported modes

5.3. Simultaneous Transmission

The device can not support simultaneous transmission.

5.4. Antenna Location

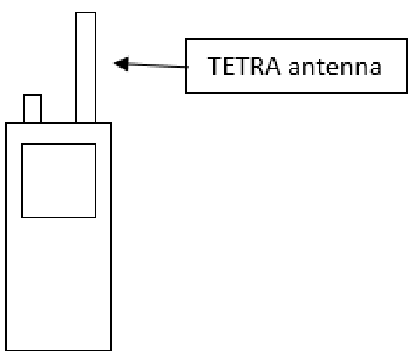


Figure 8: Antenna location sketch.

Appendix B: Test results

Index

1. TEST CONDITIONS

1.1. Power supply (V):

V_n = 7.4 V rechargeable battery

Type of power supply = DC Voltage from rechargeable 7.4 V battery.

1.2. Temperature (ºC):

Tn = +20.00 to +25.00

The subscript n indicates normal test conditions.

1.3. DUT information and test-site configurations

The DUT was tested over head, front of face and body exposure conditions:

- For head tests, the DUT was placed into cheek position on the left side of the SAM phantom.

- For in-front-of face test, the DUT was placed with the front face against the flat side of the SAM phantom, with a testing distance of 25 mm.

- For body tests, the DUT was placed at 5 mm from the flat phantom for body-worn measurements.

2. CONDUCTED AVERAGE POWER MEASUREMENTS

2.1. TETRA

Mode	Frequency (MHz)	Modulation	Average Output Power (dBm)
TETRA 450 - 470 MHz	450.00	TETRA	28.00

3. TISSUE PARAMETERS MEASUREMENTS

requency (MHz)	Target Head Tissue		Measured Head Tissue		Deviation %		Measured Date
	Permittivity ε	Conductivity σ [S/m]	Permittivity ε	Conductivity σ [S/m]	Permittivity ε	Conductivity σ [S/m]	
450	43.50	0.87	44.10	0.84	1.38	-3.94	2024-04-29
450	43.50	0.87	45.36	0.86	4.27	-1.14	2024-05-02

Note: The dielectric properties have been measured by the contact probe method at 22° C.

DASY5 and DASY6 measurement systems have a SAR error compensation algorithm to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters, so the tolerance for εr and σ may be relaxed to ± 10%.

- Composition / Information on ingredients

Head and Muscle Tissue Simulation Liquids HSL450V2/MSL450V2

Water	Water, 35 – 58%
Sucrose	Sugar, white, refined, 40 – 60%
NaCl	Sodium Chloride, 0 – 6%
Hydroxyethyl-cellulose	Medium Viscosity (CAS# 9004-62-0), <0.3%
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyyl-3(2H)-isothiazolone, 0.1 – 0.7%

4. SYSTEM CHECK MEASUREMENTS

Execution Date	Frequency (MHz)	Exposure Conditions	SAR over	Fast SAR (W/Kg)	SAR (W/Kg)	1 W Target SAR (W/Kg)	1 W Nor. SAR (W/Kg)	Drift (%)
2024-04-29	450	Head	1-g	0.48	0.46	4.65	4.55	-2.15
2024-04-29	450	Head	10-g	0.33	0.31	3.09	3.09	0.00
2024-05-02	450	Head	1-g	0.47	0.45	4.65	4.52	-2.80
2024-05-02	450	Head	10-g	0.33	0.31	3.09	3.07	-0.65

5. MEASUREMENT RESULTS FOR SAR (SPECIFIC ABSORPTION RATE)

5.1. TETRA SPOT CHECKING

Antenna	Exposure Conditions	Position	Dist (mm)	Frequency (MHz)	Estimated SAR 10-g (W/kg)	SAR 10-g (W/kg)	Power Drift (%)	Plot No.
300-00663	Head	Left Cheek	0	450.00	3.33	3.22	0.04	1
300-00663	Front of Face	Front of face	25	450.00	1.07	1.08	-0.04	2
300-00663	Body	Front face	5	450.00	1.98	2.06	0.04	3

The SAR measurements for the SC2324 model, using the worst-case SAR measurement on the SC2024, are lower than those for the SC2024, and are in the uncertainty range of the laboratory, as shown in the following table:

Exposure Conditions	Position	Dist (mm)	Frequency (MHz)	SC2324 SAR 1-g (W/kg)	SC2024 SAR 1-g (W/kg)	ΔSAR SC2324 and SC2024 (W/kg)	SC2324 Plot No.
Head	Left Cheek	0	450.00	3.22	3.31	-0.09	1
Front of face	Front of face	25	450.00	1.08	1.15	-0.07	2
Body	Front face	5	450.00	2.06	2.09	-0.03	3

Appendix C: Measurement report

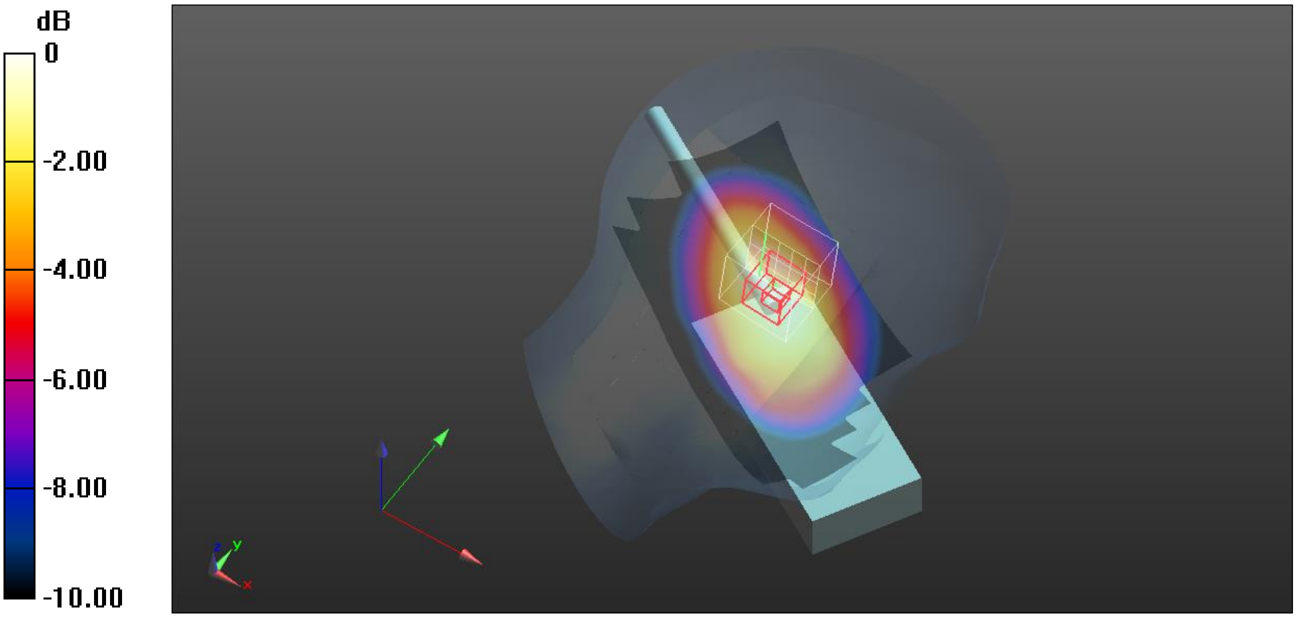
Plot Nº1

Test Laboratory: DEKRA Testing and Certification, S.A.U; Date: 02/05/2024
DUT: SC2324; Type: PTT Radio; Serial: 1PR002235GK694T
Communication System: UID 0, TETRA (0); Frequency: 450 MHz; Duty Cycle: 1:4.00037
Medium parameters used: f = 450 MHz; σ = 0.86 S/m; ε_r = 45.36; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:
- Probe: EX3DV4 - SN7461; ConvF(11.07, 11.07, 11.07) @ 450 MHz; Calibrated: 17/08/2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/08/2023
- Phantom: SAM head-body simulator ; Type: Twin SAM V4.0; Serial: ---
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Left Hand Side_ant 300-00663/FCC TETRA, 450 MHz, Cheek/Area Scan (71x181x1):
Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.99 W/kg

Left Hand Side_ant 300-00663/FCC TETRA, 450 MHz, Cheek/Zoom Scan (6x6x5)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 62.09 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 4.55 W/kg
SAR(1 g) = 3.22 W/kg; SAR(10 g) = 2.32 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 22.3 mm
Ratio of SAR at M2 to SAR at M1 = 68.8%
Maximum value of SAR (measured) = 3.92 W/kg



0 dB = 3.99 W/kg = 6.01 dBW/kg

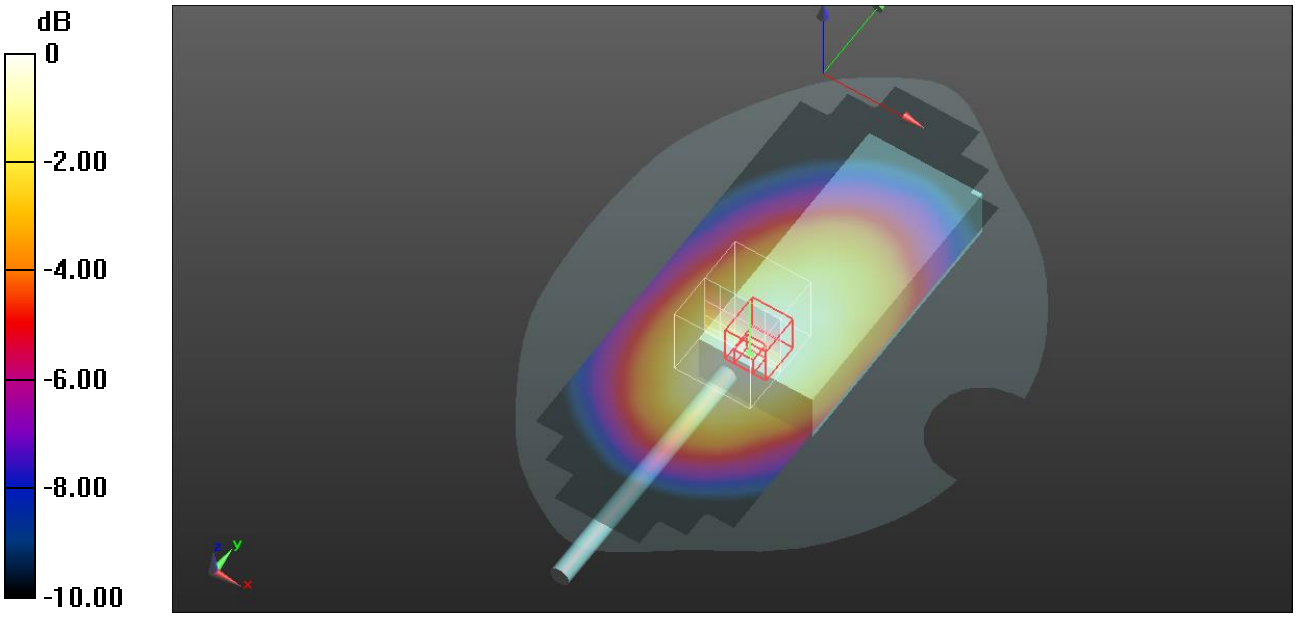
Plot Nº2

Test Laboratory: DEKRA Testing and Certification, S.A.U; Date: 30/04/2024
DUT: SC2324; Type: PTT Radio; Serial: 1PR002235GK694T
Communication System: UID 0, TETRA (0); Frequency: 450 MHz; Duty Cycle: 1:4.00037
Medium parameters used: f = 450 MHz; σ = 0.84 S/m; ε_r = 44.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:
- Probe: EX3DV4 - SN7461; ConvF(11.07, 11.07, 11.07) @ 450 MHz; Calibrated: 17/08/2023
- Sensor-Surface: 3mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/08/2023
- Phantom: SAM head-body simulator ; Type: Twin SAM V4.0; Serial: ---
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Flat Phantom, Front of Face, d=25mm/Ant_300-00663, FCC/ISED TETRA, 450 MHz, Front of face/Area Scan (71x181x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.16 W/kg

Flat Phantom, Front of Face, d=25mm/Ant_300-00663, FCC/ISED TETRA, 450 MHz, Front of face/Zoom Scan (6x7x5)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 37.46 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.44 W/kg
SAR(1 g) = 1.08 W/kg; SAR(10 g) = 0.806 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid (> 20 mm)
Ratio of SAR at M2 to SAR at M1 = 76.2%
Maximum value of SAR (measured) = 1.23 W/kg



0 dB = 1.16 W/kg = 0.64 dBW/kg

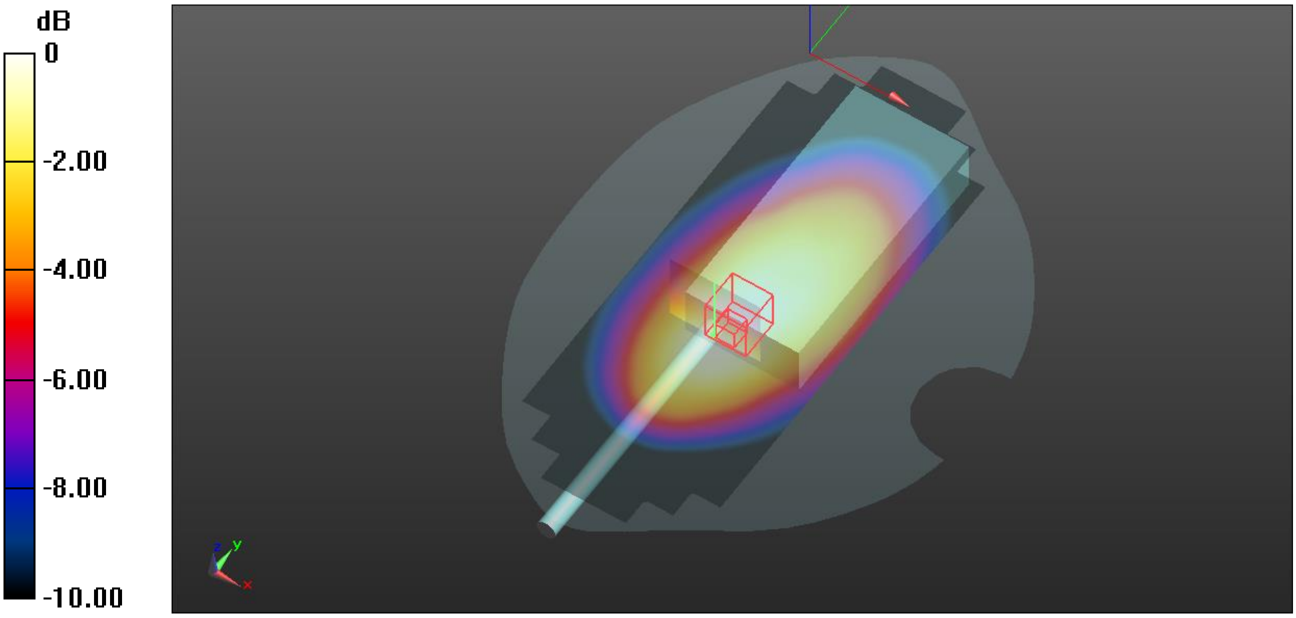
Plot Nº3

Test Laboratory: DEKRA Testing and Certification, S.A.U; Date: 02/05/2024
DUT: SC2324; Type: PTT Radio; Serial: 1PR002235GK694T
Communication System: UID 0, TETRA (0); Frequency: 450 MHz; Duty Cycle: 1:4.00037
Medium parameters used: f = 450 MHz; σ = 0.86 S/m; ε_r = 45.36; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:
- Probe: EX3DV4 - SN7461; ConvF(11.07, 11.07, 11.07) @ 450 MHz; Calibrated: 17/08/2023
- Sensor-Surface: 3mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/08/2023
- Phantom: SAM head-body simulator ; Type: Twin SAM V4.0; Serial: ---
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Flat Phantom, Body worn, d=5mm, ant 300-01031/Ant_300-00663, FCC TETRA, 450 MHz, Front Face/Area Scan (71x181x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.19 W/kg

Flat Phantom, Body worn, d=5mm, ant 300-01031/Ant_300-00663, FCC TETRA, 450 MHz, Front Face/Zoom Scan (7x7x5)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 51.17 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 2.87 W/kg
SAR(1 g) = 2.06 W/kg; SAR(10 g) = 1.52 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 24.1 mm
Ratio of SAR at M2 to SAR at M1 = 67.8%
Maximum value of SAR (measured) = 2.43 W/kg



0 dB = 2.19 W/kg = 3.40 dBW/kg

Appendix D: System Validation Report

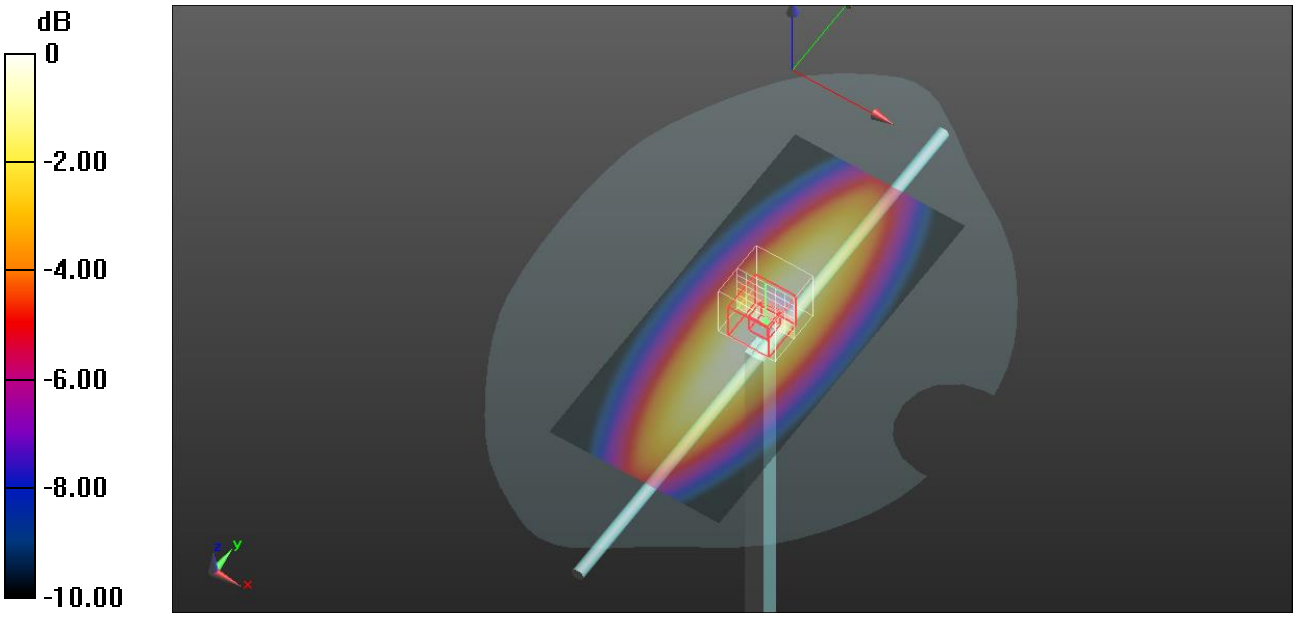
Validation results in 450 MHz Band for Head TSL

Test Laboratory: DEKRA Testing and Certification, S.A.U; Date: 29/04/2024
DUT: D450V3 - SN1092; Type: D450V3; Serial: SN1092
Communication System: UID 0, CW (0); Frequency: 450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 450 MHz; σ = 0.84 S/m; ε_r = 44.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:
- Probe: EX3DV4 - SN7461; ConvF(11.07, 11.07, 11.07) @ 450 MHz; Calibrated: 17/08/2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/08/2023
- Phantom: SAM head-body simulator ; Type: Twin SAM V4.0; Serial: ---
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Configuration 450MHz, 2024-04-29/d=15mm, Pin=250 mW/Area Scan (61x131x1):
Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.553 W/kg

Configuration 450MHz, 2024-04-29/d=15mm, Pin=250 mW/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 25.77 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.654 W/kg
SAR(1 g) = 0.455 W/kg; SAR(10 g) = 0.309 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid (> 15 mm)
Ratio of SAR at M2 to SAR at M1 = 67.7%
Maximum value of SAR (measured) = 0.551 W/kg



0 dB = 0.553 W/kg = -2.57 dBW/kg

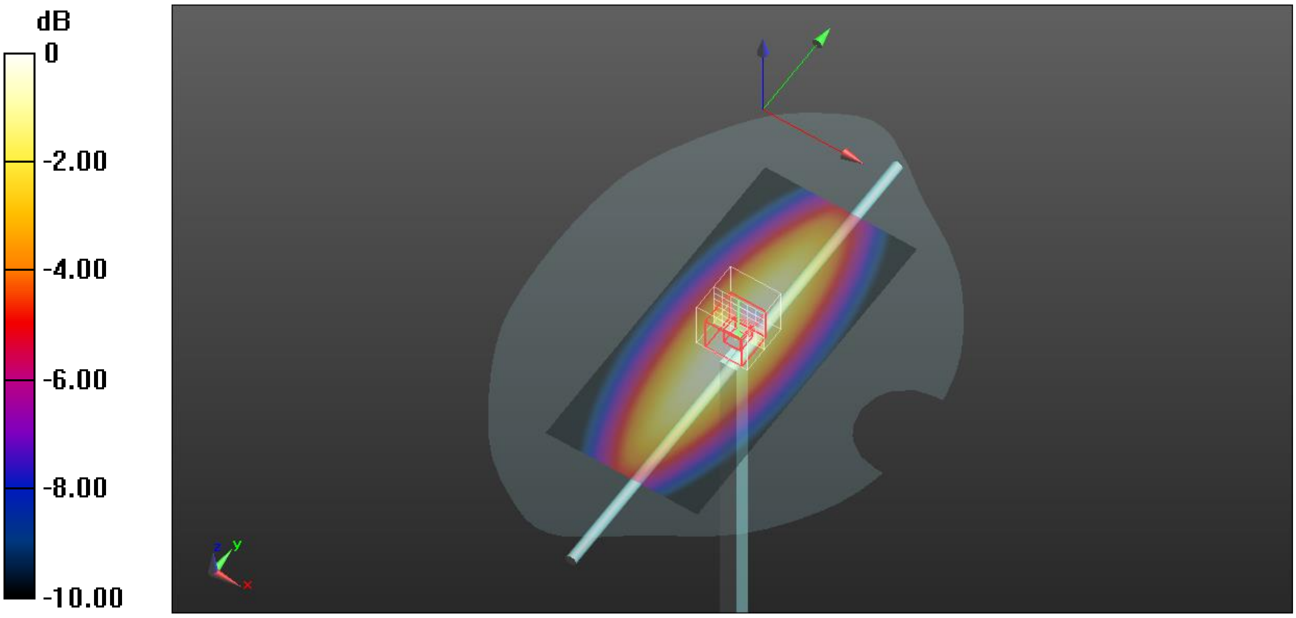
Validation results in 450 MHz Band for Head TSL

Test Laboratory: DEKRA Testing and Certification, S.A.U; Date: 29/04/2024
DUT: D450V3 - SN1092; Type: D450V3; Serial: SN1092
Communication System: UID 0, CW (0); Frequency: 450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 450 MHz; σ = 0.84 S/m; ε_r = 44.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:
- Probe: EX3DV4 - SN7461; ConvF(11.07, 11.07, 11.07) @ 450 MHz; Calibrated: 17/08/2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 08/08/2023
- Phantom: SAM head-body simulator ; Type: Twin SAM V4.0; Serial: ---
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Configuration 450MHz, 2024-04-29/d=15mm, Pin=250 mW/Area Scan (61x131x1):
Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.553 W/kg

Configuration 450MHz, 2024-04-29/d=15mm, Pin=250 mW/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 25.77 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.654 W/kg
SAR(1 g) = 0.455 W/kg; SAR(10 g) = 0.309 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid (> 15 mm)
Ratio of SAR at M2 to SAR at M1 = 67.7%
Maximum value of SAR (measured) = 0.551 W/kg



0 dB = 0.553 W/kg = -2.57 dBW/kg