SAR TEST REPORT

24T04Z101135-013

For

Schok LLC

ChronoVolt Smartwatch

Model Name: ChronoVolt_CV16

with

Hardware Version: 1V0

Software Version: CV16_01.02.01

FCC ID: 2AM9L-CV16

Issued Date: 2024-09-26

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

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REPORT HISTORY

Report Number	Revision	Issue Date	Description
24T04Z101135-013	Rev.0	2024-09-26	Initial creation of test report

TABLE OF CONTENT

1 Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 accredited test laboratory under American Association for Laboratory Accreditation (A2LA) with lab code 7049.01, and is also an FCC accredited test laboratory (CN1349), and ISED accredited test laboratory (CAB identifier:CN0066). The detail accreditation scope can be found on A2LA website.

1.2. Testing Location

Location 1: CTTL(huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191

1.3. Testing Environment

Normal Temperature:	15-35℃
Extreme Temperature:	-10/+55℃
Relative Humidity:	20-75%

1.4. Project data

Testing Start Date:	2024-09-02
Testing End Date:	2024-09-14

1.5. Signature

Wang Meng

(Prepared this test report)

Qi Dianyuan

(Reviewed this test report)

Lu Bingsong

Deputy Director of the laboratory

(Approved this test report)

2 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for Schok LLC ChronoVolt Smartwatch ChronoVolt_CV16 are as follows:

Table 2.1: Highest Reported SAR (1g)

Exposure Configuration	Technology Band	Highest Reported SAR (W/kg)	Limited (W/kg)
Limb-worn (Separation Distance 0mm)	LTE Band 5	0.78	**4.0(10g)**
	LTE Band 12	0.91	
	LTE Band 13	1.49	
	LTE Band 2/25	1.96	
	LTE Band 4/66	1.50	
	LTE Band 71	0.55	
	WLAN 2.4 GHz	0.16	
	BT	<0.01	
Front-of-face (Separation Distance 10mm)	LTE Band 5	0.83	**1.6(1g)**
	LTE Band 12	0.24	
	LTE Band 13	0.40	
	LTE Band 2/25	1.22	
	LTE Band 4/66	1.13	
	LTE Band 71	0.14	
	WLAN 2.4 GHz	0.15	
	BT	<0.01	

The SAR values found for the Mobile Phone are below the maximum recommended levels of 1.6 W/kg as averaged over any 1g tissue according to the ANSI C95.1-1992.

For body operation, this device has been tested and meets FCC RF exposure guidelines when used with any accessory that contains no metal and which provides a minimum separation distance of 10 mm between this device and the body of the user. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.
The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output.
The measurement together with the test system set-up is described in annex C of this test report. A detailed description of the equipment under test can be found in chapter 4 of this test report. The highest reported SAR value is obtained at the case of **(Table 2.1),** and the values are**: 1.96** W/kg(10g) for limb-worn and **1.22** W/kg(1g) for front-of-face.

Table 2.2: The sum of SAR values for Main antenna + WIFI

	Position	Main antenna	WiFi2.4G	Sum
Highest SAR value	Limb-worn	1.961 (LTE Band25)	0.158	**2.119**

Table 2.3: The sum of SAR values for Main antenna + WIFI

	Position	Main antenna	WiFi2.4G	Sum
Highest SAR value	Front-of-face	1.218 (LTE Band25)	0.149	**1.367**

Note1: the test positions of above tables are for the worse case that have been evaluated.

According to the above table, the maximum sum of SAR values for simultaneous transmission are **2.119 W/kg (10g)** for limb-worn and **1.367** W/kg(1g) for front-of-face.

3 Client Information

3.1 Applicant Information

Company Name:	Schok LLC
Address/Post:	5850 Town and Country Blvd, Suite 203, Frisco, TX 75034, USA
Contact Person:	Michael Harshbarger
E-mail:	mike.harsh@schokgear.com
Telephone:	+1-847-809-3294
Fax:	/

3.2 Manufacturer Information

Company Name:	Schok LLC
Address/Post:	5850 Town and Country Blvd, Suite 203, Frisco, TX 75034, USA
Contact Person:	Michael Harshbarger
E-mail:	mike.harsh@schokgear.com
Telephone:	+1-847-809-3294
Fax:	/

4 Equipment Under Test (EUT) and Ancillary Equipment (AE)

4.1 About EUT

Description:	ChronoVolt Smartwatch
Model name:	ChronoVolt_CV16
Tested Band:	LTE Band2/4/5/12/13/25/66/71 BT, Wi-Fi(2.4G)
Tx Frequency:	1850 – 1910 MHz(LTE Band 2)
	1710 – 1755 MHz (LTE Band 4)
	824 – 849 MHz (LTE Band 5)
	699 – 716 MHz (LTE Band 12)
	777 –787 MHz (LTE Band 13)
	1850 – 1915 MHz(LTE Band 25)
	1710 – 1780 MHz (LTE Band 66)
	663 – 698 MHz (LTE Band 71)
	2412 – 2462 MHz (Wi-Fi 2.4G)
	2400 – 2483.5 MHz (Bluetooth)
Test device production information:	Production unit
Device type:	Portable device
Antenna type:	Integrated antenna

4.2 Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version
EUT1	357167500000795	1V0	CV16_01.02.01
EUT2	357167500000811	1V0	CV16_01.02.01
EUT3	357167500004318	1V0	CV16_01.02.01
EUT4	357167500000720	1V0	CV16_01.02.01
EUT5	357167500000506	1V0	CV16_01.02.01
EUT6	357167500003344	1V0	CV16_01.02.01

*EUT ID: is used to identify the test sample in the lab internally.

Note: It is performed to test SAR with the EUT1-3 and conducted power with the EUT4-6.

4.3 Internal Identification of AE used during the test

AE ID*	Description	Model	SN	Manufacturer
AE1	Battery	572829A	/	HUATIANTONG

*AE ID: is used to identify the test sample in the lab internally.

5 TEST METHODOLOGY

5.1 Applicable Limit Regulations

ANSI C95.1–1992:IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

It specifies the maximum exposure limit of **1.6 W/kg** as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

5.2 Applicable Measurement Standards

IEEE 1528–2013: Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

KDB447498 D01: General RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

KDB648474 D04 Handset SAR v01r03: SAR Evaluation Considerations for Wireless Handsets.

KDB941225 D05 SAR for LTE Devices v02r05: SAR Evaluation Considerations for LTE Devices

KDB865664 D01SAR measurement 100 MHz to 6 GHz v01r04: SAR Measurement Requirements for 100 MHz to 6 GHz.

KDB248227 D01 802.11 Wi-Fi SAR v02r02: SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS

KDB865664 D02RF Exposure Reporting v01r02: RF Exposure Compliance Reporting and Documentation Considerations

6 Specific Absorption Rate (SAR)

6.1 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.

6.2 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:

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

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

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

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

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.

7 Tissue Simulating Liquids

7.1 Targets for tissue simulating liquid

Table 7.1: Targets for tissue simulating liquid

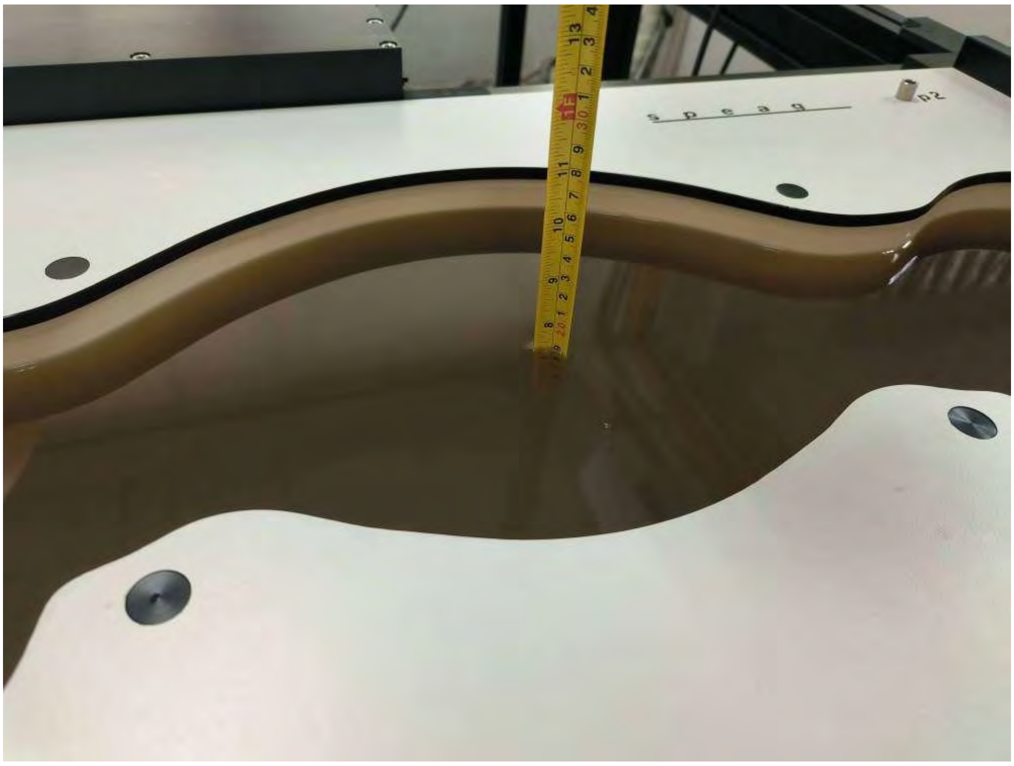
Frequency(MHz)	Liquid Type	Conductivity(σ)	±5% Range	Permittivity(ε)	± 5% Range
750	Head	0.89	0.85～0.93	41.94	39.8～44.0
835	Head	0.90	0.86～0.95	41.5	39.4～43.6
1750	Head	1.37	1.30～1.44	40.08	38.1～42.1
1900	Head	1.40	1.33～1.47	40.0	38.0～42.0
2450	Head	1.80	1.62～1.98	39.2	35.28～43.12

7.2 Dielectric Performance

Table 7.2: Dielectric Performance of Tissue Simulating Liquid

Measurement Date (yyyy-mm-dd)	Type	Frequency	Permittivity ε	Drift (%)	Conductivity σ (S/m)	Drift (%)
2024/9/2	Head	750 MHz	41.55	-0.93	0.857	-3.71
2024/9/2	Head	835 MHz	41.22	-0.67	0.894	-0.67
2024/9/14	Head	1750 MHz	38.98	-2.74	1.35	-1.46
2024/9/14	Head	1900 MHz	38.8	-3.00	1.441	2.93
2024/9/8	Head	2450 MHz	37.74	-3.72	1.852	2.89

Note: The liquid temperature is 22.0℃

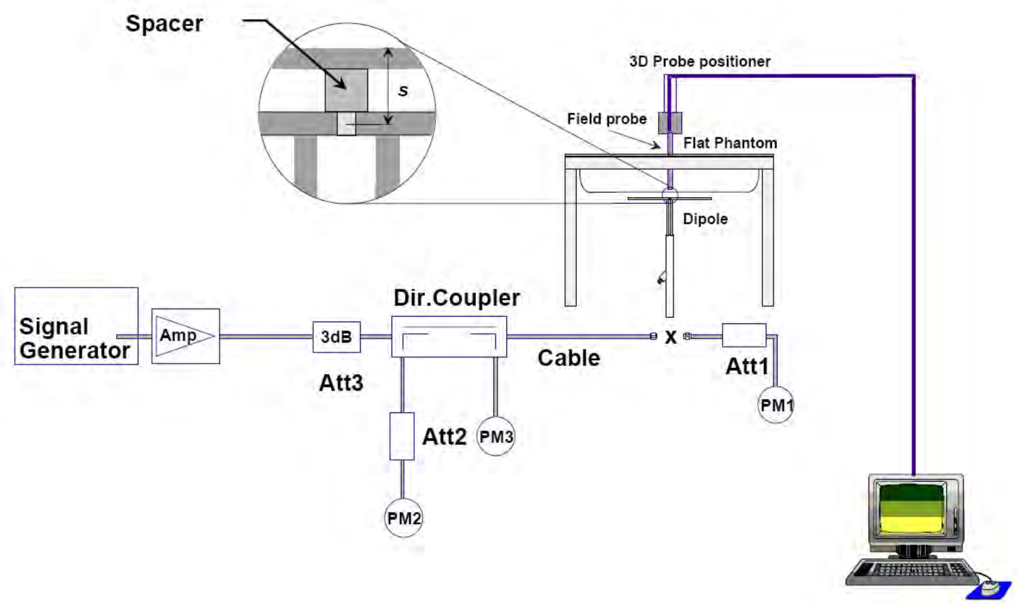


Picture 7 Liquid depth in the Head Phantom (2450 MHz)

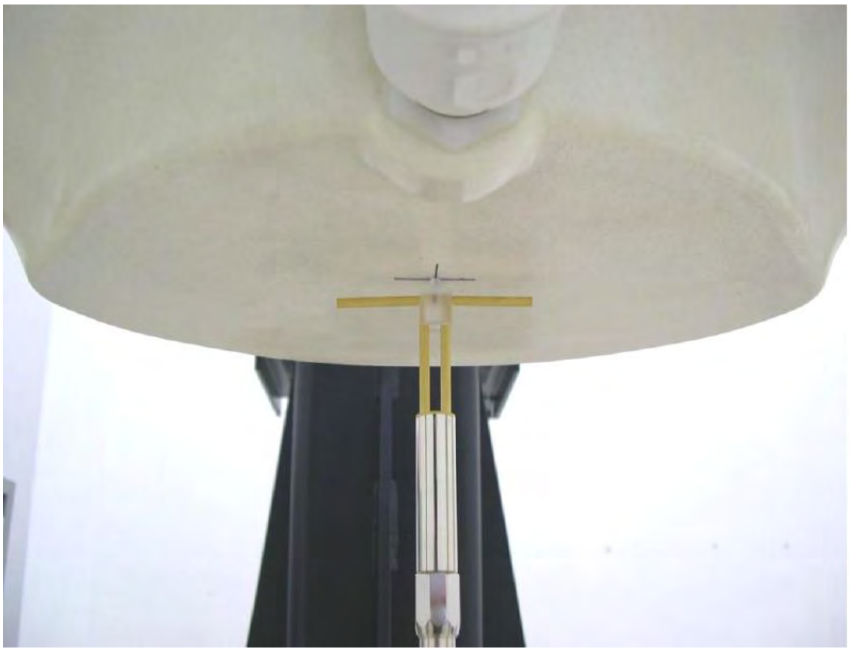
8 System verification

8.1 System Setup

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:



Picture 8.1 System Setup for System Evaluation



Picture 8.2 Photo of Dipole Setup

8.2 System Verification

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device.

The system verification results are required that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR. The details are presented in annex B.

Table 8.1: System Verification of Head

Measurement Date (yyyy-mm-dd)	Frequency	Target value (W/kg)		Measured value(W/kg)		Deviation	
		10 g Average	1 g Average	10 g Average	1 g Average	10 g Average	1 g Average
2024/9/2	750 MHz	5.53	8.52	5.64	8.60	1.99%	0.94%
2024/9/2	835 MHz	6.09	9.47	6.28	9.48	3.12%	0.11%
2024/9/14	1750 MHz	19.8	37.2	19.2	36.6	-3.23%	-1.72%
2024/9/14	1900 MHz	20.6	39.1	20.4	39.8	-0.78%	1.79%
2024/9/8	2450 MHz	24.5	52.2	24.6	53.2	0.24%	1.92%

9 Measurement Procedures

9.1 Tests to be performed

In order to determine the highest value of the peak spatial-average SAR of a handset, all device positions, configurations and operational modes shall be tested for each frequency band according to steps 1 to 3 below. A flowchart of the test process is shown in picture 9.1.

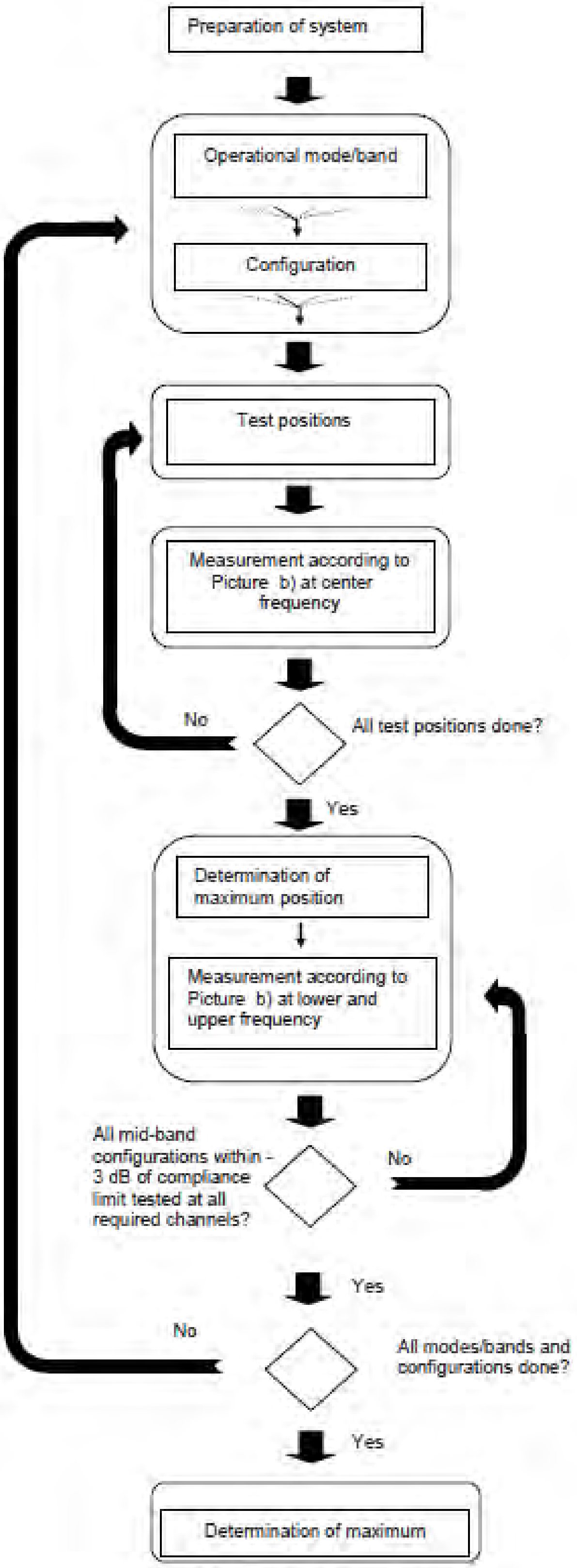
Step 1: The tests described in 9.2 shall be performed at the channel that is closest to the centre of the transmit frequency band (f_c) for:

a) all device positions (cheek and tilt, for both left and right sides of the SAM phantom, as described in annex D),
b) all configurations for each device position in a), e.g., antenna extended and retracted, and
c) all operational modes, e.g., analogue and digital, for each device position in a) and configuration in b) in each frequency band.

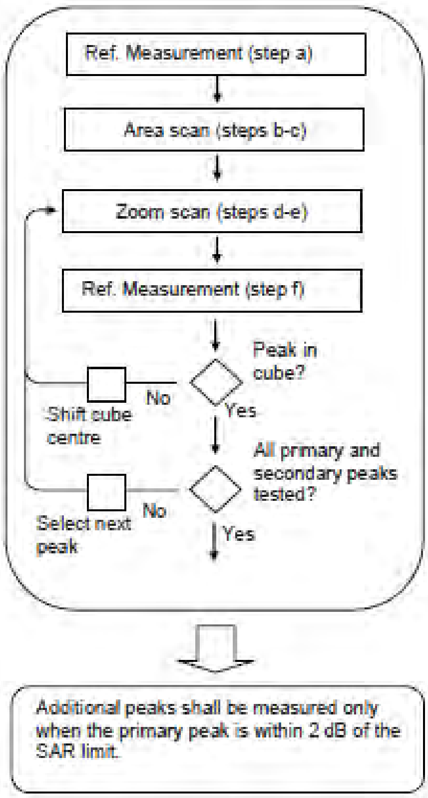
If more than three frequencies need to be tested according to 11.1 (i.e., N_c > 3), then all frequencies, configurations and modes shall be tested for all of the above test conditions.

Step 2: For the condition providing highest peak spatial-average SAR determined in Step 1,perform all tests described in 9.2 at all other test frequencies, i.e., lowest and highest frequencies. In addition, for all other conditions (device position, configuration and operational mode) where the peak spatial-average SAR value determined in Step 1 is within3 dB of the applicable SAR limit, it is recommended that all other test frequencies shall be tested as well.

Step 3: Examine all data to determine the highest value of the peak spatial-average SAR found in Steps 1 to 2.



Picture a – Tests to be performed



Picture b – General procedure

Picture 9-1 Block diagram of the tests to be performed

9.2 General Measurement Procedure

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements and fully documented in SAR reports to qualify for TCB approval. Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2003. The results should be documented as part of the system validation records and may be requested to support test results when all the measurement parameters in the following table are not satisfied.

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ $1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the *reported* SAR from the area scan based *1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

9.3 SAR Measurement for LTE

SAR tests for LTE are performed with a base station simulator, Rohde & Rchwarz CMW500. Closed loop power control was used so the UE transmits with maximum output power during SAR testing.
All powers were measured with the CMW 500.
It is performed for conducted power and SAR based on the KDB941225 D05.
SAR is evaluated separately according to the following procedures for the different test positions in each exposure condition – head, body, body-worn accessories and other use conditions. The procedures in the following subsections are applied separately to test each LTE frequency band.

1) QPSK with 1 RB allocation
   Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.
2) QPSK with 50% RB allocation
   The procedures required for 1 RB allocation in 1) are applied to measure the SAR for QPSK with 50% RB allocation.
3) QPSK with 100% RB allocation
   For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in 1) and 2) are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

9.4 Bluetooth & Wi-Fi Measurement Procedures for SAR

Normal network operating configurations are not suitable for measuring the SAR of 802.11 transmitters in general. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure that the results are consistent and reliable.

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in a test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

9.5 Power Drift

To control the output power stability during the SAR test, DASY4 system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in section14 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

10 Conducted Output Power

10.1 LTE Measurement result

Maximum Target Power for Production Unit

Band	Tune up
LTE Band 5	25
LTE Band 12	25
LTE Band 13	25
LTE Band 2/25	22.5
LTE Band 4/66	22.5
LTE Band 71	24.5

Maximum Power Reduction (MPR) for LTE

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR (dB)
	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	3

LTE Band5

BANDWIDTH	Number of RBs	Frequency	QPSK	16QAM	64QAM
1.4MHz	1RB-High (5)	848.3 (20643)	23.64	22.78	21.41
		836.5 (20525)	23.59	22.07	21.29
		824.7 (20407)	23.75	22.61	21.26
	1RB-Middle (3)	848.3 (20643)	23.69	22.86	21.69
		836.5 (20525)	23.64	22.14	21.61
		824.7 (20407)	23.65	22.68	21.36
	1RB-Low (0)	848.3 (20643)	23.67	22.27	21.44
		836.5 (20525)	23.57	22.07	21.70
		824.7 (20407)	23.54	22.54	21.74
	3RB-High (3)	848.3 (20643)	23.88	22.56	21.66
		836.5 (20525)	23.95	22.57	21.32
		824.7 (20407)	23.87	22.91	21.45
	3RB-Middle (1)	848.3 (20643)	23.89	22.59	21.69
		836.5 (20525)	23.74	22.40	21.16
		824.7 (20407)	23.97	22.86	21.32
	3RB-Low (0)	848.3 (20643)	23.83	22.47	21.64
		836.5 (20525)	23.70	22.53	21.11
		824.7 (20407)	23.85	22.92	21.15
	6RB (0)	848.3 (20643)	22.60	21.54	20.42
		836.5 (20525)	22.65	21.57	20.58
		824.7 (20407)	22.56	21.76	20.47
3MHz	1RB-High (14)	847.5 (20635)	23.76	22.29	21.25
		836.5 (20525)	23.59	22.17	21.62
		825.5 (20415)	23.79	22.29	21.69
	1RB-Middle (7)	847.5 (20635)	23.99	22.49	21.82
		836.5 (20525)	23.58	22.36	21.64
		825.5 (20415)	23.77	22.21	21.75
	1RB-Low (0)	847.5 (20635)	23.71	22.16	21.20
		836.5 (20525)	23.67	22.12	21.63
		825.5 (20415)	23.72	22.32	21.63
	8RB-High (7)	847.5 (20635)	22.77	21.76	20.56
		836.5 (20525)	22.67	21.97	20.43
		825.5 (20415)	22.74	22.16	20.58
	8RB-Middle (4)	847.5 (20635)	22.84	21.87	20.67
		836.5 (20525)	22.63	21.83	20.41
		825.5 (20415)	22.70	22.21	20.53
	8RB-Low (0)	847.5 (20635)	22.67	21.80	20.49
		836.5 (20525)	22.72	21.81	20.49
		825.5 (20415)	22.71	21.80	20.57
	15RB (0)	847.5 (20635)	22.68	21.63	20.69
		836.5 (20525)	22.70	21.76	20.43
		825.5 (20415)	22.65	21.75	20.61

5MHz	1RB-High (24)	846.5 (20625)	23.65	22.73	21.49
		836.5 (20525)	23.56	22.27	21.93
		826.5 (20425)	23.49	22.06	21.25
	1RB-Middle (12)	846.5 (20625)	24.00	22.90	21.72
		836.5 (20525)	23.67	22.42	21.75
		826.5 (20425)	23.60	22.46	21.83
	1RB-Low (0)	846.5 (20625)	23.58	22.07	21.24
		836.5 (20525)	23.56	22.04	21.59
		826.5 (20425)	23.69	22.14	21.53
	12RB-High (13)	846.5 (20625)	22.67	21.58	20.68
		836.5 (20525)	22.68	21.58	20.47
		826.5 (20425)	22.70	21.71	20.60
	12RB-Middle (6)	846.5 (20625)	22.59	21.72	20.61
		836.5 (20525)	22.66	21.65	20.91
		826.5 (20425)	22.73	21.95	20.56
	12RB-Low (0)	846.5 (20625)	22.60	21.55	20.72
		836.5 (20525)	22.63	21.81	20.66
		826.5 (20425)	22.63	21.69	20.55
	25RB (0)	846.5 (20625)	22.59	21.61	20.35
		836.5 (20525)	22.65	21.75	20.85
		826.5 (20425)	22.73	21.67	20.72
10MHz	1RB-High (49)	844 (20600)	23.54	22.75	21.64
		836.5 (20525)	23.51	22.13	21.66
		829 (20450)	23.61	22.14	21.22
	1RB-Middle (24)	844 (20600)	23.78	22.90	21.74
		836.5 (20525)	23.91	22.63	21.86
		829 (20450)	23.95	22.53	21.69
	1RB-Low (0)	844 (20600)	23.49	22.25	21.61
		836.5 (20525)	23.55	22.14	21.17
		829 (20450)	23.46	22.47	21.69
	25RB-High (25)	844 (20600)	22.77	22.10	20.62
		836.5 (20525)	22.70	21.95	20.72
		829 (20450)	22.73	21.79	20.73
	25RB-Middle (12)	844 (20600)	22.80	21.84	20.63
		836.5 (20525)	22.69	22.03	20.84
		829 (20450)	22.81	22.04	20.78
	25RB-Low (0)	844 (20600)	22.74	21.89	20.53
		836.5 (20525)	22.78	22.02	20.66
		829 (20450)	22.76	21.91	20.70
	50RB (0)	844 (20600)	22.75	21.71	20.53
		836.5 (20525)	22.74	21.79	20.57
		829 (20450)	22.75	21.72	20.56

LTE Band12

BANDWIDTH	Number of RBs	Frequency	QPSK	16QAM	64QAM
1.4MHz	1RB-High (5)	715.3 (23173)	23.15	22.63	21.63
		707.5 (23095)	23.47	22.31	21.90
		699.7 (23017)	23.58	22.40	22.19
	1RB-Middle (3)	715.3 (23173)	23.27	22.40	21.84
		707.5 (23095)	23.53	22.36	21.75
		699.7 (23017)	23.44	22.20	21.93
	1RB-Low (0)	715.3 (23173)	23.28	22.10	21.52
		707.5 (23095)	23.35	22.37	21.80
		699.7 (23017)	23.49	22.15	21.70
	3RB-High (3)	715.3 (23173)	23.59	22.28	21.79
		707.5 (23095)	23.53	22.23	21.55
		699.7 (23017)	23.50	22.14	22.00
	3RB-Middle (1)	715.3 (23173)	23.64	22.33	22.02
		707.5 (23095)	23.69	22.33	21.80
		699.7 (23017)	23.56	22.40	22.04
	3RB-Low (0)	715.3 (23173)	23.78	22.41	21.36
		707.5 (23095)	23.85	22.42	21.74
		699.7 (23017)	23.56	22.26	21.43
	6RB (0)	715.3 (23173)	22.45	21.51	20.74
		707.5 (23095)	22.31	21.29	20.63
		699.7 (23017)	22.36	21.53	20.71
3MHz	1RB-High (14)	714.5 (23165)	23.41	22.35	22.04
		707.5 (23095)	23.30	22.12	21.48
		700.5 (23025)	23.40	22.14	21.87
	1RB-Middle (7)	714.5 (23165)	23.63	22.11	21.97
		707.5 (23095)	23.61	22.20	21.92
		700.5 (23025)	23.25	22.00	22.01
	1RB-Low (0)	714.5 (23165)	23.42	22.12	21.67
		707.5 (23095)	23.43	22.18	21.96
		700.5 (23025)	23.49	22.18	21.74
	8RB-High (7)	714.5 (23165)	22.63	21.51	20.76
		707.5 (23095)	22.55	21.44	20.60
		700.5 (23025)	22.30	21.51	20.92
	8RB-Middle (4)	714.5 (23165)	22.56	21.40	20.79
		707.5 (23095)	22.42	21.54	20.71
		700.5 (23025)	22.23	21.45	20.80
	8RB-Low (0)	714.5 (23165)	22.54	21.52	20.98
		707.5 (23095)	22.57	21.60	20.92
		700.5 (23025)	22.32	21.46	20.72
	15RB (0)	714.5 (23165)	22.52	21.38	20.85
		707.5 (23095)	22.54	21.52	20.83
		700.5 (23025)	22.19	21.33	20.97

5MHz	1RB-High (24)	713.5 (23155)	23.16	22.28	21.47
		707.5 (23095)	23.37	22.50	21.39
		701.5 (23035)	23.55	22.05	21.56
	1RB-Middle (12)	713.5 (23155)	23.60	22.23	21.88
		707.5 (23095)	23.68	22.66	22.03
		701.5 (23035)	23.39	22.16	21.82
	1RB-Low (0)	713.5 (23155)	23.42	22.02	21.55
		707.5 (23095)	23.51	22.08	21.94
		701.5 (23035)	23.35	22.03	21.53
	12RB-High (13)	713.5 (23155)	22.43	21.38	20.87
		707.5 (23095)	22.45	21.32	20.88
		701.5 (23035)	22.45	21.70	20.61
	12RB-Middle (6)	713.5 (23155)	22.57	21.56	20.84
		707.5 (23095)	22.65	21.75	21.03
		701.5 (23035)	22.45	21.49	20.65
	12RB-Low (0)	713.5 (23155)	22.47	21.48	20.75
		707.5 (23095)	22.62	21.51	20.98
		701.5 (23035)	22.35	21.29	20.83
	25RB (0)	713.5 (23155)	22.38	21.59	20.68
		707.5 (23095)	22.43	21.54	20.71
		701.5 (23035)	22.46	21.52	21.00
10MHz	1RB-High (49)	711 (23130)	23.44	22.63	21.78
		707.5 (23095)	23.22	22.04	21.56
		704 (23060)	23.42	22.06	21.94
	1RB-Middle (24)	711 (23130)	23.61	22.28	21.91
		707.5 (23095)	23.75	22.64	22.34
		704 (23060)	23.57	22.31	22.21
	1RB-Low (0)	711 (23130)	23.51	22.51	22.34
		707.5 (23095)	23.38	22.06	22.06
		704 (23060)	23.58	22.07	21.82
	25RB-High (25)	711 (23130)	22.52	21.63	21.04
		707.5 (23095)	22.34	21.46	20.69
		704 (23060)	22.46	21.55	20.84
	25RB-Middle (12)	711 (23130)	22.51	21.64	20.93
		707.5 (23095)	22.55	21.52	20.83
		704 (23060)	22.51	21.68	20.78
	25RB-Low (0)	711 (23130)	22.43	21.56	20.88
		707.5 (23095)	22.48	21.61	20.81
		704 (23060)	22.38	21.66	20.99
	50RB (0)	711 (23130)	22.53	21.60	21.06
		707.5 (23095)	22.50	21.53	21.01
		704 (23060)	22.47	21.56	20.92

LTE Band13

BANDWIDTH	Number of RBs	Frequency	QPSK	16QAM	64QAM
5MHz	1RB-High (24)	784.5 (23255)	23.31	22.65	21.83
		782 (23230)	23.78	22.89	21.96
		779.5 (23205)	23.68	22.39	21.62
	1RB-Middle (12)	784.5 (23255)	23.54	22.19	21.84
		782 (23230)	23.41	22.54	21.96
		779.5 (23205)	23.79	22.63	22.09
	1RB-Low (0)	784.5 (23255)	23.80	22.09	21.36
		782 (23230)	23.56	22.52	21.86
		779.5 (23205)	23.79	22.54	21.71
	12RB-High (13)	784.5 (23255)	22.78	21.78	20.87
		782 (23230)	22.74	21.61	20.75
		779.5 (23205)	22.63	21.70	20.77
	12RB-Middle (6)	784.5 (23255)	22.72	21.81	20.99
		782 (23230)	22.69	21.78	20.85
		779.5 (23205)	22.75	21.70	20.97
	12RB-Low (0)	784.5 (23255)	22.59	21.74	20.76
		782 (23230)	22.65	21.84	20.94
		779.5 (23205)	22.82	21.86	21.03
	25RB (0)	784.5 (23255)	22.67	21.98	20.69
		782 (23230)	22.66	21.75	20.75
		779.5 (23205)	22.61	21.97	20.88
10MHz	1RB-High (49)	782 (23230)	23.45	22.15	22.03
	1RB-Middle (24)	782 (23230)	23.53	22.42	22.18
	1RB-Low (0)	782 (23230)	23.50	22.24	22.06
	25RB-High (25)	782 (23230)	22.68	21.71	20.67
	25RB-Middle (12)	782 (23230)	22.75	21.80	20.93
	25RB-Low (0)	782 (23230)	22.63	21.90	20.75
	50RB (0)	782 (23230)	22.67	21.76	20.85

LTE Band25

BANDWIDTH	Number of RBs	Frequency	QPSK	16QAM	64QAM
1.4MHz	1RB-High (5)	1914.3 (26683)	20.89	20.06	20.09
		1882.5 (26365)	21.96	20.26	19.65
		1850.7 (26047)	21.97	20.68	19.96
	1RB-Middle (3)	1914.3 (26683)	21.80	20.22	20.03
		1882.5 (26365)	21.93	20.62	19.98
		1850.7 (26047)	21.83	20.59	19.90
	1RB-Low (0)	1914.3 (26683)	20.88	19.96	19.96
		1882.5 (26365)	21.70	20.45	20.12
		1850.7 (26047)	21.70	20.66	19.82
	3RB-High (3)	1914.3 (26683)	21.96	20.83	19.89
		1882.5 (26365)	21.78	20.79	20.19
		1850.7 (26047)	21.16	20.95	19.69
	3RB-Middle (1)	1914.3 (26683)	22.16	20.79	19.71
		1882.5 (26365)	21.77	20.84	20.17
		1850.7 (26047)	21.35	21.03	19.74
	3RB-Low (0)	1914.3 (26683)	22.09	20.81	19.89
		1882.5 (26365)	21.79	20.94	19.72
		1850.7 (26047)	22.12	21.04	19.85
	6RB (0)	1914.3 (26683)	21.11	19.71	18.80
		1882.5 (26365)	20.87	19.92	18.99
		1850.7 (26047)	20.98	19.97	19.18
3MHz	1RB-High (14)	1913.5 (26675)	21.83	20.59	19.67
		1882.5 (26365)	21.82	20.45	20.05
		1851.5 (26055)	21.98	20.64	19.79
	1RB-Middle (7)	1913.5 (26675)	21.82	20.80	20.26
		1882.5 (26365)	21.96	20.74	20.05
		1851.5 (26055)	21.97	20.88	20.42
	1RB-Low (0)	1913.5 (26675)	21.80	20.66	19.69
		1882.5 (26365)	21.93	20.83	19.67
		1851.5 (26055)	21.86	20.87	20.23
	8RB-High (7)	1913.5 (26675)	20.93	20.05	19.01
		1882.5 (26365)	21.03	20.10	18.97
		1851.5 (26055)	20.30	20.06	19.12
	8RB-Middle (4)	1913.5 (26675)	20.99	20.15	19.08
		1882.5 (26365)	20.96	20.14	19.02
		1851.5 (26055)	21.03	20.15	19.12
	8RB-Low (0)	1913.5 (26675)	20.88	20.06	18.96
		1882.5 (26365)	20.93	20.10	19.00
		1851.5 (26055)	20.58	20.19	19.06
	15RB (0)	1913.5 (26675)	20.81	19.97	18.88
		1882.5 (26365)	21.00	20.04	18.99
		1851.5 (26055)	20.98	20.06	19.02

5MHz	1RB-High (24)	1912.5 (26665)	21.90	21.15	19.65
		1882.5 (26365)	21.74	20.26	19.58
		1852.5 (26065)	21.90	20.68	19.69
	1RB-Middle (12)	1912.5 (26665)	21.85	20.76	20.00
		1882.5 (26365)	21.96	20.92	20.13
		1852.5 (26065)	22.00	20.87	20.03
	1RB-Low (0)	1912.5 (26665)	21.70	20.73	19.77
		1882.5 (26365)	21.91	20.58	19.71
		1852.5 (26065)	22.11	20.91	19.72
	12RB-High (13)	1912.5 (26665)	20.96	20.05	18.85
		1882.5 (26365)	21.01	20.10	19.02
		1852.5 (26065)	21.09	20.17	19.09
	12RB-Middle (6)	1912.5 (26665)	21.06	20.17	18.94
		1882.5 (26365)	21.04	19.94	19.07
		1852.5 (26065)	21.09	20.08	18.73
	12RB-Low (0)	1912.5 (26665)	20.97	19.99	18.76
		1882.5 (26365)	21.01	20.00	18.93
		1852.5 (26065)	21.13	20.13	19.00
	25RB (0)	1912.5 (26665)	20.95	20.01	19.08
		1882.5 (26365)	20.98	20.08	19.19
		1852.5 (26065)	21.04	20.14	18.84
10MHz	1RB-High (49)	1910 (26640)	21.91	20.68	19.76
		1882.5 (26365)	21.86	20.60	19.78
		1855 (26090)	22.11	20.70	20.24
	1RB-Middle (24)	1910 (26640)	21.88	20.83	19.80
		1882.5 (26365)	22.07	20.61	20.31
		1855 (26090)	22.08	20.58	20.30
	1RB-Low (0)	1910 (26640)	21.87	20.73	20.00
		1882.5 (26365)	22.05	20.91	19.84
		1855 (26090)	22.06	20.84	19.92
	25RB-High (25)	1910 (26640)	21.00	20.05	19.11
		1882.5 (26365)	21.11	20.05	19.15
		1855 (26090)	21.18	20.14	19.19
	25RB-Middle (12)	1910 (26640)	20.99	20.19	19.02
		1882.5 (26365)	21.14	20.11	19.28
		1855 (26090)	21.17	20.13	19.19
	25RB-Low (0)	1910 (26640)	20.99	20.06	18.86
		1882.5 (26365)	21.03	20.09	19.15
		1855 (26090)	21.10	20.18	19.11
	50RB (0)	1910 (26640)	20.98	20.14	19.03
		1882.5 (26365)	21.08	20.08	19.05
		1855 (26090)	21.12	20.20	19.04

15MHz	1RB-High (74)	1907.5 (26615)	21.93	21.14	20.12
		1882.5 (26365)	21.73	20.62	20.03
		1857.5 (26115)	21.99	21.03	20.01
	1RB-Middle (37)	1907.5 (26615)	21.90	20.68	19.62
		1882.5 (26365)	22.00	21.25	20.25
		1857.5 (26115)	22.09	20.40	20.13
	1RB-Low (0)	1907.5 (26615)	21.86	20.73	19.59
		1882.5 (26365)	21.93	20.94	20.27
		1857.5 (26115)	22.18	20.86	20.33
	36RB-High (38)	1907.5 (26615)	20.90	19.97	18.93
		1882.5 (26365)	21.00	19.95	19.06
		1857.5 (26115)	21.25	20.24	19.21
	36RB-Middle (19)	1907.5 (26615)	20.94	19.99	19.07
		1882.5 (26365)	21.12	20.01	19.04
		1857.5 (26115)	21.12	20.02	19.12
	36RB-Low (0)	1907.5 (26615)	20.89	20.00	18.96
		1882.5 (26365)	20.98	20.03	19.06
		1857.5 (26115)	21.13	20.13	19.23
	75RB (0)	1907.5 (26615)	21.00	20.15	19.13
		1882.5 (26365)	21.05	20.15	19.01
		1857.5 (26115)	21.17	20.17	19.42
20MHz	1RB-High (99)	1905 (26590)	22.02	21.04	20.28
		1882.5 (26365)	21.93	20.60	19.89
		1860 (26140)	22.22	20.63	20.02
	1RB-Middle (50)	1905 (26590)	21.96	21.44	20.07
		1882.5 (26365)	22.14	20.69	20.00
		1860 (26140)	22.31	21.33	20.50
	1RB-Low (0)	1905 (26590)	22.03	21.00	20.02
		1882.5 (26365)	22.37	20.85	20.01
		1860 (26140)	22.05	20.50	20.38
	50RB-High (50)	1905 (26590)	20.96	20.10	19.20
		1882.5 (26365)	21.02	20.20	19.26
		1860 (26140)	21.30	20.23	19.29
	50RB-Middle (25)	1905 (26590)	20.99	20.27	19.16
		1882.5 (26365)	21.11	20.28	19.23
		1860 (26140)	21.31	20.27	19.30
	50RB-Low (0)	1905 (26590)	21.01	20.22	19.10
		1882.5 (26365)	21.16	20.22	18.99
		1860 (26140)	21.17	20.13	19.18
	100RB (0)	1905 (26590)	21.02	20.13	19.04
		1882.5 (26365)	21.13	20.01	19.14
		1860 (26140)	21.22	20.26	19.24

LTE Band66

BANDWIDTH	Number of RBs	Frequency	QPSK	16QAM	64QAM
1.4MHz	1RB-High (5)	1779.3 (132665)	21.98	20.78	20.07
		1745 (132322)	22.31	20.88	20.05
		1710.7 (131979)	22.30	21.47	20.29
	1RB-Middle (3)	1779.3 (132665)	22.08	20.92	20.24
		1745 (132322)	22.39	21.02	20.34
		1710.7 (131979)	22.24	20.99	20.16
	1RB-Low (0)	1779.3 (132665)	21.99	20.86	20.15
		1745 (132322)	22.42	20.92	20.08
		1710.7 (131979)	22.25	20.80	20.21
	3RB-High (3)	1779.3 (132665)	22.21	21.25	19.98
		1745 (132322)	22.38	21.30	20.34
		1710.7 (131979)	22.44	21.36	19.93
	3RB-Middle (1)	1779.3 (132665)	22.13	21.12	19.70
		1745 (132322)	22.49	21.49	19.90
		1710.7 (131979)	22.47	21.19	20.02
	3RB-Low (0)	1779.3 (132665)	22.35	21.41	19.64
		1745 (132322)	22.16	21.39	19.87
		1710.7 (131979)	22.49	21.19	19.99
	6RB (0)	1779.3 (132665)	21.14	20.32	19.13
		1745 (132322)	21.32	20.43	19.38
		1710.7 (131979)	21.26	20.24	19.22
3MHz	1RB-High (14)	1778.5 (132657)	21.82	20.72	19.73
		1745 (132322)	22.32	20.76	19.77
		1711.5 (131987)	22.31	20.83	19.95
	1RB-Middle (7)	1778.5 (132657)	22.02	20.93	20.26
		1745 (132322)	22.40	20.93	20.23
		1711.5 (131987)	22.44	21.08	20.25
	1RB-Low (0)	1778.5 (132657)	21.96	20.98	19.86
		1745 (132322)	22.24	20.91	19.91
		1711.5 (131987)	21.99	20.73	20.21
	8RB-High (7)	1778.5 (132657)	21.05	20.35	19.11
		1745 (132322)	21.38	20.41	19.49
		1711.5 (131987)	21.34	20.50	19.28
	8RB-Middle (4)	1778.5 (132657)	21.08	20.40	19.13
		1745 (132322)	21.42	20.47	19.35
		1711.5 (131987)	21.34	20.42	19.18
	8RB-Low (0)	1778.5 (132657)	21.15	20.33	19.13
		1745 (132322)	21.40	20.45	19.42
		1711.5 (131987)	21.35	20.34	19.30
	15RB (0)	1778.5 (132657)	21.07	20.27	19.12
		1745 (132322)	21.34	20.39	19.34
		1711.5 (131987)	21.36	20.33	19.31

5MHz	1RB-High (24)	1777.5 (132647)	21.80	21.15	20.04
		1745 (132322)	22.26	20.81	20.07
		1712.5 (131997)	22.23	20.77	19.83
	1RB-Middle (12)	1777.5 (132647)	22.04	20.98	20.27
		1745 (132322)	22.38	21.05	20.29
		1712.5 (131997)	22.36	20.96	20.33
	1RB-Low (0)	1777.5 (132647)	21.88	20.89	20.07
		1745 (132322)	22.27	21.03	19.91
		1712.5 (131997)	22.18	20.88	19.92
	12RB-High (13)	1777.5 (132647)	21.01	20.14	19.03
		1745 (132322)	21.39	20.39	19.36
		1712.5 (131997)	21.31	20.12	19.25
	12RB-Middle (6)	1777.5 (132647)	21.16	20.09	19.24
		1745 (132322)	21.45	20.36	19.43
		1712.5 (131997)	21.28	20.10	19.40
	12RB-Low (0)	1777.5 (132647)	21.12	20.22	19.09
		1745 (132322)	21.45	20.30	19.04
		1712.5 (131997)	21.33	20.28	19.31
	25RB (0)	1777.5 (132647)	21.04	20.19	19.28
		1745 (132322)	21.39	20.13	19.12
		1712.5 (131997)	21.37	20.32	19.33
10MHz	1RB-High (49)	1775 (132622)	21.01	20.93	19.86
		1745 (132322)	22.34	21.21	20.11
		1715 (132022)	22.41	20.93	19.96
	1RB-Middle (24)	1775 (132622)	20.96	21.39	20.14
		1745 (132322)	22.45	20.92	20.12
		1715 (132022)	22.43	21.24	20.10
	1RB-Low (0)	1775 (132622)	20.91	20.73	20.30
		1745 (132322)	22.32	20.94	20.46
		1715 (132022)	22.13	20.93	20.28
	25RB-High (25)	1775 (132622)	20.98	20.27	19.04
		1745 (132322)	21.33	20.39	19.16
		1715 (132022)	21.25	20.29	19.42
	25RB-Middle (12)	1775 (132622)	21.06	20.35	19.11
		1745 (132322)	21.41	20.26	19.02
		1715 (132022)	21.32	20.25	19.32
	25RB-Low (0)	1775 (132622)	21.05	20.08	18.90
		1745 (132322)	21.35	20.44	19.15
		1715 (132022)	21.25	20.18	19.16
	50RB (0)	1775 (132622)	21.11	20.10	19.11
		1745 (132322)	21.43	20.46	19.46
		1715 (132022)	21.35	20.30	19.40

15MHz	1RB-High (74)	1772.5 (132597)	21.67	20.73	20.10
		1745 (132322)	21.51	21.03	20.43
		1717.5 (132047)	21.49	20.91	20.04
	1RB-Middle (37)	1772.5 (132597)	21.61	20.42	20.15
		1745 (132322)	21.59	21.10	20.01
		1717.5 (132047)	21.50	20.95	19.92
	1RB-Low (0)	1772.5 (132597)	21.49	20.83	20.25
		1745 (132322)	21.44	21.10	20.30
		1717.5 (132047)	21.28	20.83	20.38
	36RB-High (38)	1772.5 (132597)	20.31	20.13	19.18
		1745 (132322)	20.48	20.36	19.50
		1717.5 (132047)	20.54	20.29	19.29
	36RB-Middle (19)	1772.5 (132597)	20.32	20.15	19.29
		1745 (132322)	20.62	20.41	19.15
		1717.5 (132047)	20.51	20.25	19.26
	36RB-Low (0)	1772.5 (132597)	20.31	20.09	19.23
		1745 (132322)	20.52	20.33	19.17
		1717.5 (132047)	20.42	20.21	19.41
	75RB (0)	1772.5 (132597)	20.43	20.16	19.31
		1745 (132322)	20.60	20.32	19.43
		1717.5 (132047)	20.54	20.34	19.39
20MHz	1RB-High (99)	1770 (132572)	22.04	21.17	20.05
		1745 (132322)	22.38	21.13	20.13
		1720 (132072)	22.38	20.93	20.29
	1RB-Middle (50)	1770 (132572)	22.35	21.23	20.40
		1745 (132322)	22.34	21.28	20.47
		1720 (132072)	22.43	21.25	20.28
	1RB-Low (0)	1770 (132572)	21.98	20.96	20.27
		1745 (132322)	22.38	21.08	20.33
		1720 (132072)	22.11	20.92	20.41
	50RB-High (50)	1770 (132572)	21.34	20.22	19.35
		1745 (132322)	21.44	20.46	19.40
		1720 (132072)	21.42	20.28	19.47
	50RB-Middle (25)	1770 (132572)	21.20	20.17	19.35
		1745 (132322)	21.40	20.47	19.47
		1720 (132072)	21.44	20.29	19.50
	50RB-Low (0)	1770 (132572)	21.24	20.30	19.18
		1745 (132322)	21.45	20.46	19.41
		1720 (132072)	21.38	20.23	19.41
	100RB (0)	1770 (132572)	21.28	20.25	19.37
		1745 (132322)	21.16	20.49	19.40
		1720 (132072)	21.40	20.27	19.48

LTE Band71

BANDWIDTH	Number of RBs	Frequency	QPSK	16QAM	64QAM
5MHz	1RB-High (24)	695.5 (133447)	23.14	21.88	20.91
		680.5 (133297)	23.26	21.83	20.80
		665.5 (133147)	23.05	21.64	20.77
	1RB-Middle (12)	695.5 (133447)	23.27	22.57	21.18
		680.5 (133297)	23.41	21.89	21.11
		665.5 (133147)	23.38	21.85	20.87
	1RB-Low (0)	695.5 (133447)	23.19	22.21	20.94
		680.5 (133297)	23.17	21.64	21.19
		665.5 (133147)	23.01	21.58	21.23
	12RB-High (13)	695.5 (133447)	22.31	21.19	21.15
		680.5 (133297)	22.31	21.14	20.83
		665.5 (133147)	22.22	21.17	20.95
	12RB-Middle (6)	695.5 (133447)	22.35	21.21	21.18
		680.5 (133297)	22.36	21.20	20.67
		665.5 (133147)	22.27	21.20	20.83
	12RB-Low (0)	695.5 (133447)	22.28	21.11	21.14
		680.5 (133297)	22.30	21.12	20.63
		665.5 (133147)	22.17	21.09	20.66
	25RB (0)	695.5 (133447)	22.31	21.12	19.96
		680.5 (133297)	22.34	21.37	20.12
		665.5 (133147)	22.23	21.25	20.01
10MHz	1RB-High (49)	693 (132422)	23.61	22.30	20.76
		680.5 (133297)	23.28	22.17	21.12
		668 (133172)	23.26	21.99	21.18
	1RB-Middle (24)	693 (132422)	23.85	22.54	21.31
		680.5 (133297)	23.55	21.87	21.14
		668 (133172)	23.47	22.22	21.24
	1RB-Low (0)	693 (132422)	23.71	22.40	20.71
		680.5 (133297)	23.13	22.03	21.13
		668 (133172)	23.28	22.00	21.13
	25RB-High (25)	693 (132422)	22.72	21.80	20.10
		680.5 (133297)	22.40	21.48	19.97
		668 (133172)	22.30	21.31	20.12
	25RB-Middle (12)	693 (132422)	22.83	21.91	20.20
		680.5 (133297)	22.55	21.52	19.95
		668 (133172)	22.43	21.45	20.07
	25RB-Low (0)	693 (132422)	22.73	21.82	20.03
		680.5 (133297)	22.48	21.46	20.03
		668 (133172)	22.40	21.29	20.11
	50RB (0)	693 (132422)	22.73	21.84	20.22
		680.5 (133297)	22.56	21.54	19.97
		668 (133172)	22.46	21.37	20.15

15MHz	1RB-High (74)	690.5 (133397)	23.20	21.93	20.99
		680.5 (133297)	23.22	22.00	21.41
		670.5 (133197)	23.24	21.78	20.76
	1RB-Middle (37)	690.5 (133397)	23.24	22.09	21.21
		680.5 (133297)	23.43	22.50	21.24
		670.5 (133197)	23.33	21.73	21.32
	1RB-Low (0)	690.5 (133397)	23.07	21.86	20.75
		680.5 (133297)	23.29	21.84	21.09
		670.5 (133197)	23.26	21.76	21.03
	36RB-High (38)	690.5 (133397)	22.47	21.43	20.21
		680.5 (133297)	22.33	21.45	20.01
		670.5 (133197)	22.31	21.25	20.14
	36RB-Middle (19)	690.5 (133397)	22.28	21.39	20.15
		680.5 (133297)	22.45	21.44	20.43
		670.5 (133197)	22.36	21.40	20.10
	36RB-Low (0)	690.5 (133397)	22.34	21.45	20.25
		680.5 (133297)	22.28	21.28	20.19
		670.5 (133197)	22.23	21.27	20.09
	75RB (0)	690.5 (133397)	22.48	21.48	19.90
		680.5 (133297)	22.37	21.47	20.38
		670.5 (133197)	22.37	21.32	20.25
20MHz	1RB-High (99)	688 (133372)	22.98	21.78	21.14
		683 (133322)	23.16	21.81	21.15
		673 (133222)	23.04	21.63	20.73
	1RB-Middle (50)	688 (133372)	23.01	22.47	21.23
		683 (133322)	23.27	21.84	21.35
		673 (133222)	23.34	21.83	21.18
	1RB-Low (0)	688 (133372)	22.99	21.68	21.11
		683 (133322)	23.19	21.75	20.68
		673 (133222)	23.06	21.79	21.18
	50RB-High (50)	688 (133372)	22.20	21.38	20.16
		683 (133322)	22.26	21.39	20.25
		673 (133222)	22.25	21.15	20.26
	50RB-Middle (25)	688 (133372)	22.27	21.52	20.16
		683 (133322)	22.28	21.39	20.37
		673 (133222)	22.33	21.39	20.31
	50RB-Low (0)	688 (133372)	22.17	21.37	20.07
		683 (133322)	22.24	21.38	20.19
		673 (133222)	22.21	21.13	20.23
	100RB (0)	688 (133372)	22.23	21.37	20.07
		683 (133322)	22.22	21.25	20.11
		673 (133222)	22.27	21.30	20.10

11.2 Wi-Fi and BT Measurement result

The maximum output power for BT

GFSK			Tune up	EDR2M-4_DQPSK			EDR3M-8DPSK		
Channel 0	**Channel 39**	**Channel 78**		**Channel 0**	**Channel 39**	**Channel 78**	**Channel 0**	**Channel 39**	**Channel 78**
8.35	9.25	8.12	10.00	6.49	7.34	6.22	6.48	7.32	6.20

The maximum output power for WiFi 2.4G

802.11b(dBm)									Tune up
Channel\data rate	1Mbps	2Mbps	5.5Mbps	11Mbps					
11(2462MHz)	19.20	19.08	19.33	19.22					19.50
6(2437MHz)	17.68		17.68						19.50
1(2412MHz)	18.59		18.40						19.50
802.11g(dBm)									
Channel\data rate	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps	
11(2462MHz)	18.25	18.24	18.20	18.16	18.12	18.08	18.05	18.02	18.50
6(2437MHz)	16.69							/	18.50
1(2412MHz)	17.72							/	18.50
802.11n(dBm)-20MHz									
Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
11(2462MHz)	16.94	16.82	16.84	16.78	16.78	16.74	16.72	16.70	17.00
6(2437MHz)	15.21								17.00
1(2412MHz)	16.63								17.00
802.11n(dBm)-40MHz									
Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
9(2452MHz)	15.84								17.00
6(2437MHz)	16.04	16.02	15.99	15.91	15.87	15.85	15.82	15.81	17.00

11 Transmit Antenna Separation Distances

The detail for transmit antenna separation distances is described in the additional document:
Appendix to test report No.24T04Z101135-013
The photos of SAR test

12 Evaluation of Simultaneous

Test Postition \ SAR 1/10g(W/kg)		LTE B5	LTE B12	LTE B13	LTE B25	LTE B66	LTE B71	MAX. SAR 1/10g
Body 10mm	Front	0.825	0.237	0.396	1.218	1.131	0.144	1.218
Limb SAR	Rear	0.776	0.913	1.487	1.961	1.504	0.551	1.961

Test Postition \ SAR 1/10g(W/kg)		1	2	2
		WWAN	WIFI2.4G	BT
Body 10mm	Front	1.218	0.149	0.000
Limb SAR	Rear	1.961	0.158	0.000

Test Postition \ SAR 1/10g(W/kg)		simultaneous transmission		MAX. SAR 1/10g
		1+2	1+3	
Body 10mm	Front	1.367	1.218	1.367
Limb SAR	Rear	2.119	1.961	2.119

Conclusion:

According to the above tables, the sum of reported SAR values is<1.6W/kg. So the simultaneous transmission SAR with volume scans is not required.

13 SAR Test Result

Note:

KDB 447498 D01 General RF Exposure Guidance:

For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor

For BT/WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor

Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

⩽ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ⩽ 100 MHz

⩽ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz

⩽ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ⩾ 200 MHz

KDB 648474 D04 Handset SAR:

With headset attached, when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

KDB 941225 D05 SAR for LTE Devices:

SAR test reduction is applied using the following criteria:

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel.

When the reported SAR is > 0.8 W/kg, testing for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.

Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low,Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are > 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.

Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.

Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is <1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

For LTE bands that do not support at least three non-overlapping channels in certain channel bandwidths, test the available non-overlapping channels instead. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing; therefore, the requirement for H, M and L channels may not fully apply.

KDB 248227 D01 SAR meas for 802.11:

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions.An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the initial test position(s) by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The initial test position(s) is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s).

When the reported SAR for the initial test position is:

≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.

> 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions are tested.

• For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.

• When it is unclear, all equivalent conditions must be tested.

For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required test channels are considered.

•The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.

When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is ≤ 1.2 W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.

When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is ≤ 1.2 W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

Table 14.1: Duty Cycle

Mode	Duty Cycle
LTE FDD	1:1

13.1 SAR results for 4G (Front-of-face)

RF Exposure Conditions	Frequency Band	Channel Number	Frequency (MHz)	Mode/RB	Test setup	Distance	Figure No.	EUT Measured Power (dBm)	Tune up (dBm)	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)	Measured SAR 10g (W/kg)	Calculated SAR 10g (W/kg)	Power Drift
Body	LTE Band5	20600	844	1RB-Middle	Front	10mm	FIG A.1	23.78	25.00	0.623	0.825	0.410	**0.543**	-0.05
Body	LTE Band5	20525	836.5	1RB-Middle	Front	10mm	\	23.94	25.00	0.514	**0.656**	0.338	**0.431**	-0.18
Body	LTE Band5	20450	829	1RB-Middle	Front	10mm	\	23.95	25.00	0.460	**0.586**	0.301	**0.383**	-0.19
Body	LTE Band5	20450	829	25RB-Middle	Front	10mm	\	22.81	24.00	0.324	**0.426**	0.212	**0.279**	0.03
Body	LTE Band5	20600	844	100RB	Front	10mm	\	22.75	24.00	0.411	**0.548**	0.259	**0.345**	0.11
Body	LTE Band12	23130	711	1RB-Middle	Front	10mm	FIG A.2	23.61	25.00	0.172	0.237	0.114	**0.157**	-0.08
Body	LTE Band12	23095	707.5	1RB-Middle	Front	10mm	\	23.75	25.00	0.158	**0.211**	0.106	**0.141**	-0.04
Body	LTE Band12	23060	704	1RB-Low	Front	10mm	\	23.58	25.00	0.159	**0.220**	0.109	**0.151**	0.04
Body	LTE Band12	23095	707.5	25RB-Middle	Front	10mm	\	22.55	24.00	0.124	**0.173**	0.082	**0.115**	0.06
Body	LTE Band13	23230	782	1RB-Middle	Front	10mm	FIG A.3	23.53	25.00	0.282	0.396	0.185	**0.260**	-0.06
Body	LTE Band13	23230	782	25RB-Middle	Front	10mm	\	22.75	24.00	0.227	**0.303**	0.149	**0.199**	-0.14
Body	LTE Band25	26590	1905	1RB-Low	Front	10mm	\	22.03	22.50	0.944	**1.052**	0.500	**0.557**	0.11
Body	LTE Band25	26365	1882.5	1RB-Low	Front	10mm	\	22.37	22.50	0.954	**0.983**	0.510	**0.525**	-0.07
Body	LTE Band25	26140	1860	1RB-Low	Front	10mm	FIG A.4	22.25	22.50	1.150	1.218	0.589	**0.624**	0.19
Body	LTE Band25	26590	1905	50RB-Low	Front	10mm	\	21.01	22.50	0.715	**1.008**	0.382	**0.538**	0.13
Body	LTE Band25	26365	1882.5	50RB-Low	Front	10mm	\	21.16	22.50	0.723	**0.984**	0.390	**0.531**	0.02
Body	LTE Band25	26140	1860	50RB-Middle	Front	10mm	\	21.31	21.50	0.871	**0.910**	0.450	**0.470**	0.17
Body	LTE Band25	26140	1860	100RB	Front	10mm	\	21.22	21.50	0.854	**0.911**	0.439	**0.468**	0.02
Body	LTE Band66	132572	1770	1RB-Middle	Front	10mm	\	22.35	22.50	0.978	**1.012**	0.489	**0.506**	-0.02
Body	LTE Band66	132322	1745	1RB-Middle	Front	10mm	FIG A.5	22.34	22.50	1.090	1.131	0.542	**0.562**	0.18
Body	LTE Band66	132072	1720	1RB-Middle	Front	10mm	\	22.43	22.50	0.760	**0.772**	0.385	**0.391**	-0.11
Body	LTE Band66	132572	1770	50RB-High	Front	10mm	\	21.34	21.50	0.720	**0.747**	0.360	**0.374**	0.03
Body	LTE Band66	132322	1745	50RB-Low	Front	10mm	\	21.45	21.50	0.803	**0.812**	0.400	**0.405**	0.07
Body	LTE Band66	132072	1720	50RB-Middle	Front	10mm	\	21.44	21.50	0.530	**0.537**	0.271	**0.275**	0.19
Body	LTE Band66	132072	1720	100RB	Front	10mm	\	21.40	21.50	0.524	**0.536**	0.269	**0.275**	-0.06
Body	LTE Band71	133372	688	1RB-Middle	Front	10mm	\	23.01	24.50	0.078	**0.110**	0.058	**0.082**	-0.01
Body	LTE Band71	133322	683	1RB-Middle	Front	10mm	\	23.27	24.50	0.095	**0.126**	0.072	**0.096**	0.17
Body	LTE Band71	133222	673	1RB-Middle	Front	10mm	FIG A.6	23.34	24.50	0.110	0.144	0.075	**0.098**	0.03
Body	LTE Band71	133222	673	50RB-Middle	Front	10mm	\	22.33	23.50	0.083	**0.109**	0.063	**0.082**	0.19

13.2 SAR results for 4G (Limb-worn)

RF Exposure Conditions	Frequency Band	Channel Number	Frequency (MHz)	Mode/RB	Test setup	Distance	Figure No.	EUT Measured Power (dBm)	Tune up (dBm)	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)	Measured SAR 10g (W/kg)	Calculated SAR 10g (W/kg)	Power Drift
Limb	LTE Band5	20600	844	1RB-Middle	Rear	0mm	\	23.78	25.00	0.735	**0.973**	0.411	**0.544**	-0.06
Limb	LTE Band5	20525	836.5	1RB-Middle	Rear	0mm	\	23.94	25.00	0.919	**1.173**	0.518	**0.661**	-0.14
Limb	LTE Band5	20450	829	1RB-Middle	Rear	0mm	FIG A.8	23.95	25.00	1.080	**1.375**	0.609	0.776	0.14
Limb	LTE Band5	20450	829	25RB-Middle	Rear	0mm	\	22.81	24.00	0.841	**1.106**	0.476	**0.626**	-0.10
Limb	LTE Band12	23130	711	1RB-Middle	Rear	0mm	FIG A.9	23.61	25.00	1.150	**1.584**	0.663	0.913	0.03
Limb	LTE Band12	23095	707.5	1RB-Middle	Rear	0mm	\	23.75	25.00	1.090	**1.454**	0.625	**0.833**	0.06
Limb	LTE Band12	23060	704	1RB-Low	Rear	0mm	\	23.58	25.00	1.080	**1.498**	0.620	**0.860**	0.02
Limb	LTE Band12	23095	707.5	25RB-Middle	Rear	0mm	\	22.55	24.00	0.704	**0.983**	0.462	**0.645**	0.18
Limb	LTE Band13	23230	782	1RB-Middle	Rear	0mm	FIG A.10	23.53	25.00	1.840	**2.581**	1.060	1.487	-0.10
Limb	LTE Band13	23230	782	25RB-Middle	Rear	0mm	\	22.75	24.00	1.380	**1.840**	0.796	**1.061**	-0.04
Limb	LTE Band25	26590	1905	1RB-Low	Rear	0mm	FIG A.11	22.03	22.50	3.290	**3.666**	1.760	1.961	0.04
Limb	LTE Band25	26365	1882.5	1RB-Low	Rear	0mm	\	22.37	22.50	3.180	**3.277**	1.750	**1.803**	0.14
Limb	LTE Band25	26140	1860	1RB-Low	Rear	0mm	\	22.25	22.50	3.140	**3.326**	1.690	**1.790**	-0.19
Limb	LTE Band25	26140	1860	50RB-Middle	Rear	0mm	\	21.31	21.50	2.560	**2.674**	1.400	**1.463**	0.10
Limb	LTE Band66	132572	1770	1RB-Middle	Rear	0mm	\	22.35	22.50	2.370	**2.453**	1.320	**1.366**	0.19
Limb	LTE Band66	132322	1745	1RB-Middle	Rear	0mm	FIG A.12	22.34	22.50	2.590	**2.687**	1.450	1.504	0.10
Limb	LTE Band66	132072	1720	1RB-Middle	Rear	0mm	\	22.43	22.50	2.110	**2.144**	1.180	**1.199**	0.02
Limb	LTE Band66	132322	1745	50RB-Low	Rear	0mm	\	21.45	21.50	1.910	**1.932**	1.060	**1.072**	0.02
Limb	LTE Band71	133372	688	1RB-Middle	Rear	0mm	\	23.01	24.50	0.515	**0.726**	0.302	**0.426**	-0.12
Limb	LTE Band71	133322	683	1RB-Middle	Rear	0mm	\	23.27	24.50	0.458	**0.608**	0.293	**0.389**	0.08
Limb	LTE Band71	133222	673	1RB-Middle	Rear	0mm	FIG A.13	23.34	24.50	0.713	**0.931**	0.422	0.551	0.02
Limb	LTE Band71	133222	673	50RB-Middle	Rear	0mm	\	22.33	23.50	0.523	**0.685**	0.309	**0.405**	0.08

13.3 SAR results for WLAN (Front-of-face)

RF Exposure Conditions	Frequency Band	Channel Number	Frequency (MHz)	Mode/RB	Test setup	Distance	Figure No.	EUT Measured Power (dBm)	Tune up (dBm)	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)	Measured SAR 10g (W/kg)	Calculated SAR 10g (W/kg)	Power Drift
Body	WIFI2.4G	11	2462	11b	Front	10mm	FIG A.7	19.33	19.50	0.143	**0.149**	0.080	**0.083**	-0.18

13.4 SAR results for WLAN (Limb-worn)

RF Exposure Conditions	Frequency Band	Channel Number	Frequency (MHz)	Mode/RB	Test setup	Distance	Figure No.	EUT Measured Power (dBm)	Tune up (dBm)	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)	Measured SAR 10g (W/kg)	Calculated SAR 10g (W/kg)	Power Drift
Limb	WIFI2.4G	11	2462	11b	Rear	0mm	FIG A.14	19.33	19.50	0.274	**0.285**	0.152	**0.158**	-0.16

13.5 SAR results for BT (Front-of-face)

RF Exposure Conditions	Frequency Band	Channel Number	Frequency (MHz)	Mode/RB	Test setup	Distance	Figure No.	EUT Measured Power (dBm)	Tune up (dBm)	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)	Measured SAR 10g (W/kg)	Calculated SAR 10g (W/kg)	Power Drift
Body	BT	39	2441	GFSK	Front	10mm	\	9.25	10.00	<0.01	**<0.01**	<0.01	**<0.01**	

13.6 SAR results for BT (Limb-worn)

RF Exposure Conditions	Frequency Band	Channel Number	Frequency (MHz)	Mode/RB	Test setup	Distance	Figure No.	EUT Measured Power (dBm)	Tune up (dBm)	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)	Measured SAR 10g (W/kg)	Calculated SAR 10g (W/kg)	Power Drift
Limb	BT	39	2441	GFSK	Rear	0mm	\	9.25	10.00	<0.01	**<0.01**	<0.01	**<0.01**	

14 SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeated measurements are required.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps2) 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 ≥ 1.45W/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

RF Exposure Conditions	Frequency Band	Channel Number	Frequency (MHz)	Mode/RB	Test setup	Distance	Original SAR 1g (W/kg)	First Repeated SAR 1g (W/kg)	The Ratio	Second Repeated SAR 1g (W/kg)
Body	LTE Band25	26590	1905	1RB-Low	Front	10mm	0.944	0.889	1.06	/
Body	LTE Band25	26365	1882.5	1RB-Low	Front	10mm	0.954	0.894	1.07	/
Body	LTE Band25	26140	1860	1RB-Low	Front	10mm	1.150	1.110	1.04	/
Body	LTE Band25	26140	1860	50RB-Middle	Front	10mm	0.871	0.830	1.05	/
Body	LTE Band66	132572	1770	1RB-Middle	Front	10mm	0.978	0.927	1.06	/
Body	LTE Band66	132322	1745	1RB-Middle	Front	10mm	1.090	1.030	1.06	/
Body	LTE Band66	132072	1720	1RB-Middle	Front	10mm	0.760	0.723	1.05	/
Body	LTE Band66	132322	1745	50RB-Low	Front	10mm	0.803	0.756	1.06	/

15 Measurement Uncertainty

15.1 Measurement Uncertainty for Normal SAR Tests (300MHz~3GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.0	N	1	1	1	6.0	6.0	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	N	1	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RFambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
12	Probe positioning with respect to phantom shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Test sample related										
14	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
15	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
16	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
17	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
18	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
19	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
20	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
21	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521

Combined standard uncertainty	$u_c^{'} = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$					9.55	9.43	257
Expanded uncertainty (confidence interval of 95 %)	$u_e = 2u_c$					19.1	18.9	

16 MAIN TEST INSTRUMENTS

Table 16.1: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	N5239A	MY55491241	May 21, 2024	One year
02	Power sensor	NRP50S	101488	June 5, 2024	One year
03	Power sensor	NRP50S	101489		
04	Signal Generator	MG3700A	6201052605	June 12 2024	One Year
05	Amplifier	60S1G4	0331848	No Calibration Requested	
06	BTS	CMW500	170618	April 8, 2024	One year
07	DAE	SPEAG DAE4	549	January 23,2024	One year
08	E-field Probe	SPEAG EX3DV4	7673	July 29,2024	One year
09	Dipole Validation Kit	SPEAG D750V3	1017	July 9,2024	One year
10	Dipole Validation Kit	SPEAG D835V2	4d069	July 9,2024	One year
11	Dipole Validation Kit	SPEAG D1750V2	1003	July 11,2024	One year
12	Dipole Validation Kit	SPEAG D1900V2	5d101	July 8,2024	One year
13	Dipole Validation Kit	SPEAG D2450V2	853	July 10,2024	One year

END OF REPORT BODY

ANNEX A Graph Results

LTE Band5_ Front 10mm

Date: 2024/9/2

Electronics: DAE4 Sn549

Medium: H700-6000M

Medium parameters used (interpolated): f = 844 MHz; σ = 0.899 S/m; εr = 41.183; ρ = 1000 kg/m3

Ambient Temperature:23.3℃ Liquid Temperature: 22.5℃

Communication System: UID 0, LTE Band5 (0) Frequency: 844 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7673 ConvF(10.45, 10.45, 10.45)

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.886 W/kg

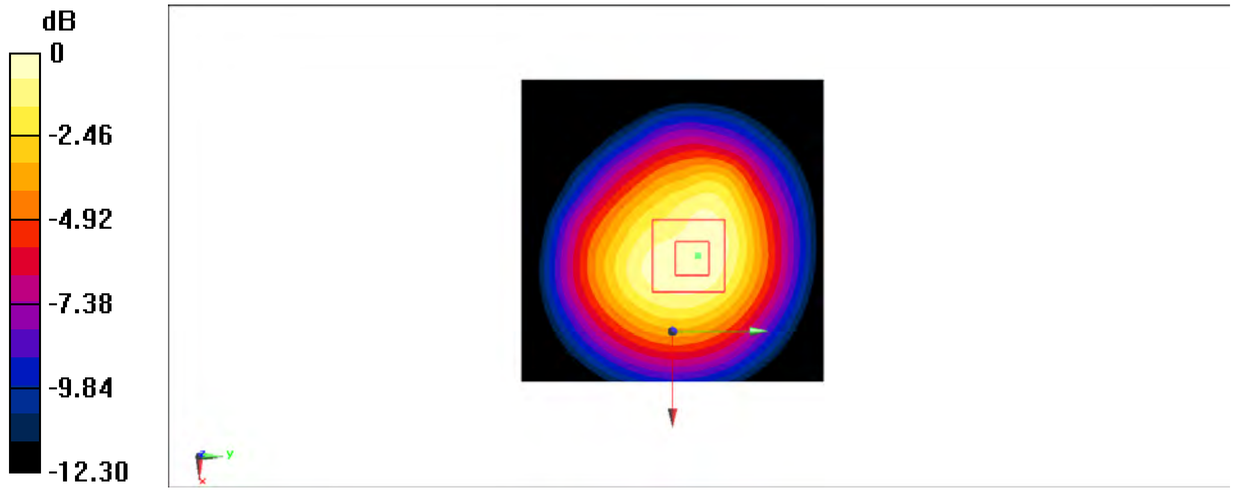
Zoom Scan (5x5x5)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 32.05 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.984 W/kg

SAR(1 g) = 0.623 W/kg; SAR(10 g) = 0.410 W/kg

Maximum value of SAR (measured) = 0.848 W/kg



0 dB = 0.848 W/kg = -0.72 dBW/kg

LTE Band12_ Front 10mm

Date: 2024/9/2

Electronics: DAE4 Sn549

Medium: H700-6000M

Medium parameters used (interpolated): f = 711 MHz; σ = 0.841 S/m; εr = 41.606; ρ = 1000 kg/m3

Ambient Temperature:23.3℃ Liquid Temperature: 22.5℃

Communication System: UID 0, LTE Band12 (0) Frequency: 711 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7673 ConvF(10.45, 10.45, 10.45)

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.249 W/kg

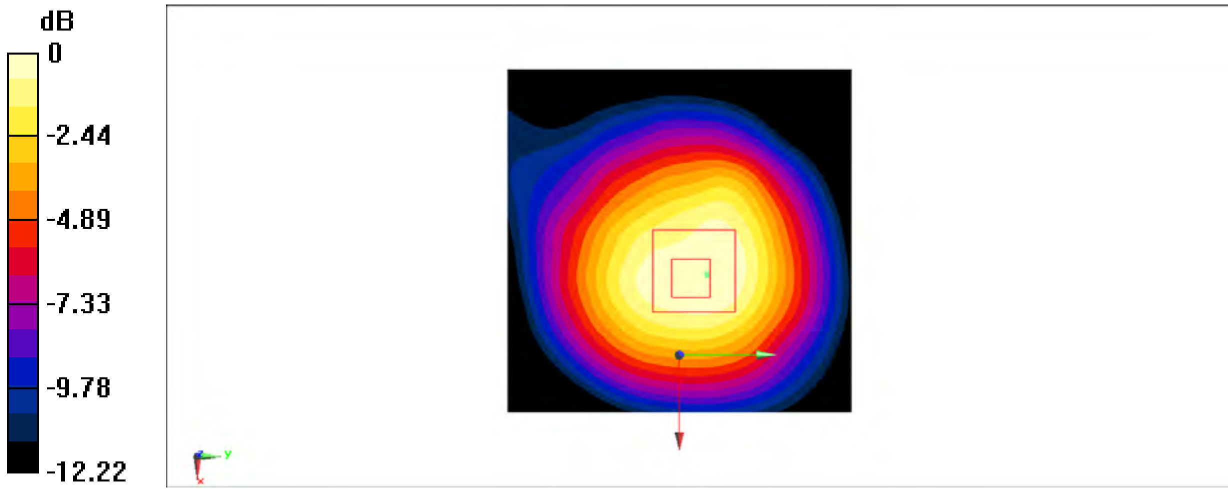
Zoom Scan (5x5x5)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.24 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 0.274 W/kg

SAR(1 g) = 0.172 W/kg; SAR(10 g) = 0.114 W/kg

Maximum value of SAR (measured) = 0.232 W/kg



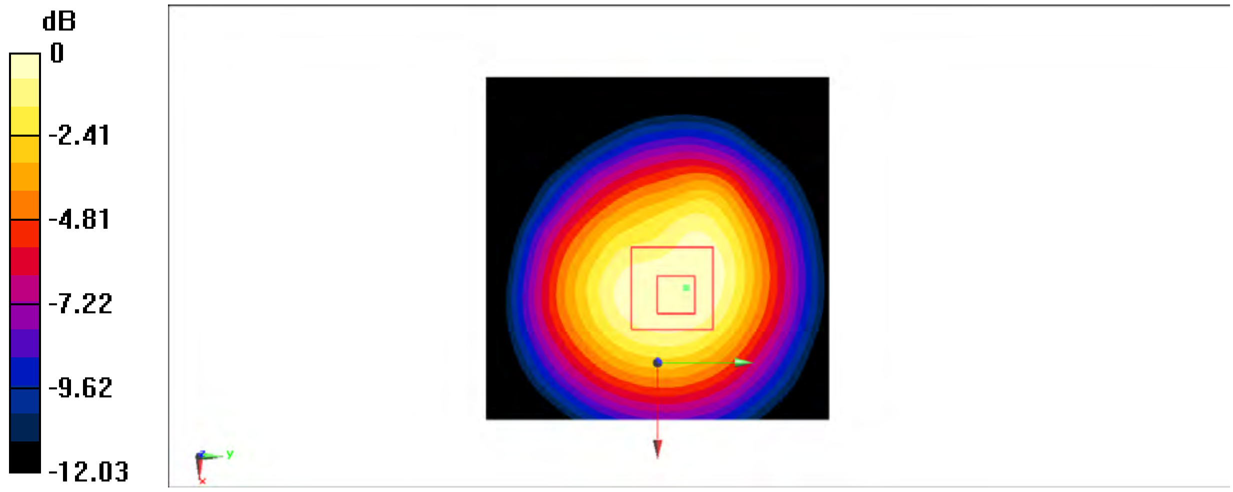
0 dB = 0.232 W/kg = -6.35 dBW/kg

LTE Band13_ Front 10mm

Date: 2024/9/2
Electronics: DAE4 Sn549
Medium: H700-6000M
Medium parameters used (interpolated): f = 782 MHz; σ = 0.873 S/m; εr = 41.418; ρ = 1000 kg/m3
Ambient Temperature:23.3°C Liquid Temperature: 22.5°C
Communication System: UID 0, LTE Band13 (0) Frequency: 782 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN7673 ConvF(10.45, 10.45, 10.45)

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.414 W/kg

Zoom Scan (5x5x5)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.02 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.453 W/kg
SAR(1 g) = 0.282 W/kg; SAR(10 g) = 0.185 W/kg
Maximum value of SAR (measured) = 0.376 W/kg



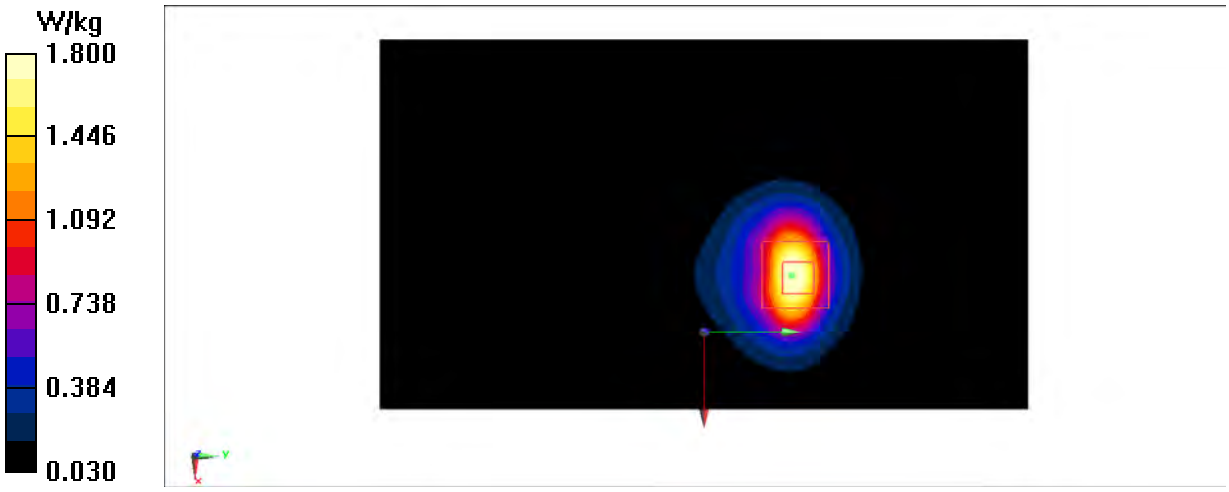
0 dB = 0.376 W/kg = -4.25 dBW/kg

LTE Band25_ Front 10mm

Date: 2024/9/14
Electronics: DAE4 Sn549
Medium: H700-6000M
Medium parameters used: f = 1860 MHz; σ = 1.409 S/m; εr = 38.851; ρ = 1000 kg/m3
Ambient Temperature:23.3℃ Liquid Temperature: 22.5℃
Communication System: UID 0, LTE Band25 (0) Frequency: 1860 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN7673 ConvF(8.1, 8.1, 8.1)

Area Scan (81x141x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.87 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.910 V/m; Power Drift = 0.19 dB
Peak SAR (extrapolated) = 2.22 W/kg
SAR(1 g) = 1.15 W/kg; SAR(10 g) = 0.589 W/kg
Maximum value of SAR (measured) = 1.80 W/kg

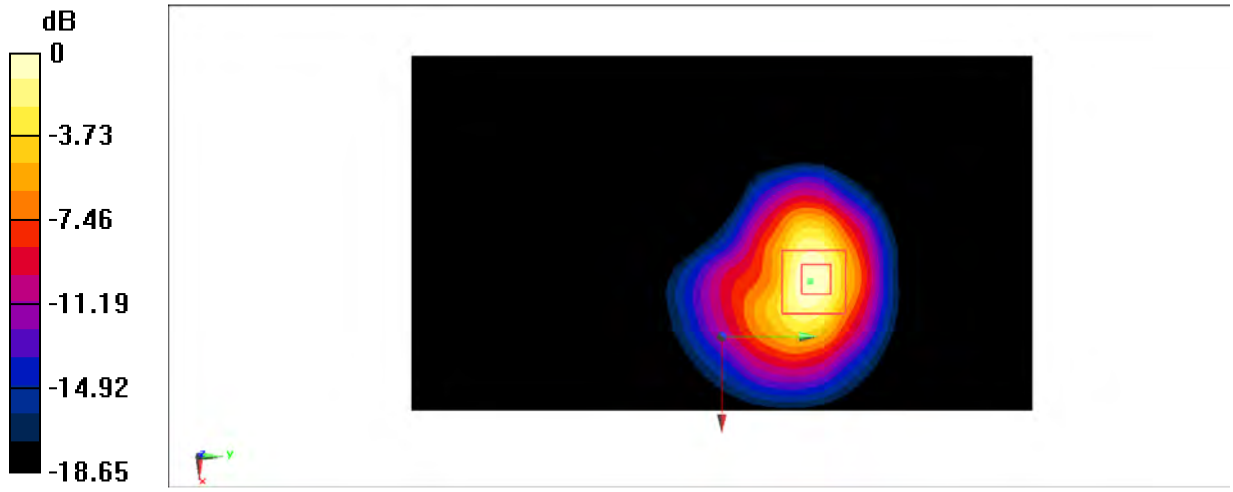


LTE Band66_ Front 10mm

Date: 2024/9/14
Electronics: DAE4 Sn549
Medium: H700-6000M
Medium parameters used: f = 1745 MHz; σ = 1.347 S/m; εr = 38.991; ρ = 1000 kg/m3
Ambient Temperature:23.3°C Liquid Temperature: 22.5°C
Communication System: UID 0, LTE Band66 (0) Frequency: 1745 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN7673 ConvF(8.45, 8.45, 8.45)

Area Scan (81x141x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.79 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.018 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 2.21 W/kg
SAR(1 g) = 1.09 W/kg; SAR(10 g) = 0.542 W/kg
Maximum value of SAR (measured) = 1.80 W/kg



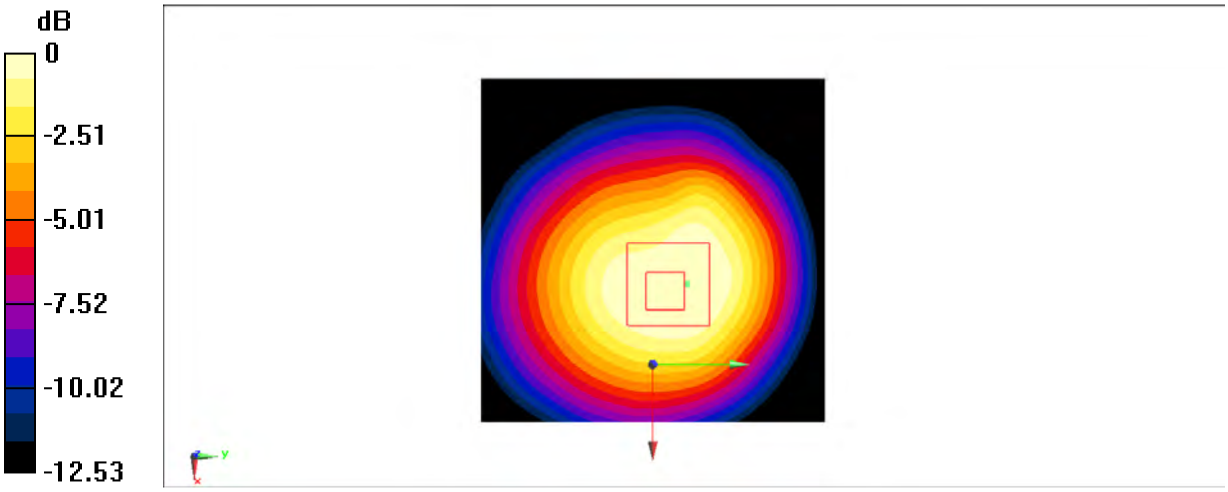
0 dB = 1.80 W/kg = 2.55 dBW/kg

LTE Band71_ Front 10mm

Date: 2024/9/2
Electronics: DAE4 Sn549
Medium: H700-6000M
Medium parameters used (extrapolated): f = 673 MHz; σ = 0.858 S/m; εr = 41.712; ρ = 1000 kg/m3
Ambient Temperature:23.3℃ Liquid Temperature: 22.5℃
Communication System: UID 0, LTE Band71 (0) Frequency: 673 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN7673 ConvF(10.45, 10.45, 10.45)

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.176 W/kg

Zoom Scan (5x6x5)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.11 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.185 W/kg
SAR(1 g) = 0.110 W/kg; SAR(10 g) = 0.075 W/kg
Maximum value of SAR (measured) = 0.146 W/kg



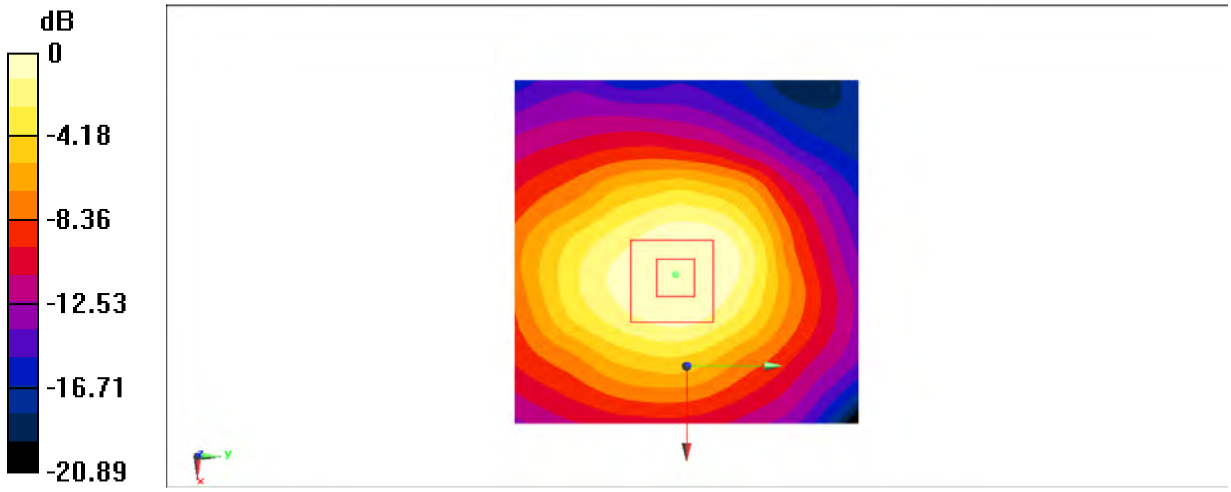
0 dB = 0.146 W/kg = -8.36 dBW/kg

WIFI2.4G_ Front 10mm

Date: 2024/9/8
Electronics: DAE4 Sn549
Medium: H700-6000M
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.861 S/m; εr = 37.715; ρ = 1000 kg/m3
Ambient Temperature:23.3°C Liquid Temperature: 22.5°C
Communication System: UID 0, WLan 2450 (0) Frequency: 2462 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN7673 ConvF(7.6, 7.6, 7.6)

Area Scan (61x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.250 W/kg

Zoom Scan (5x5x5)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.53 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 0.271 W/kg
SAR(1 g) = 0.143 W/kg; SAR(10 g) = 0.080 W/kg
Maximum value of SAR (measured) = 0.212 W/kg



0 dB = 0.212 W/kg = -6.74 dBW/kg

LTE Band5_ Rear 0mm

Date: 2024/9/2

Electronics: DAE4 Sn549

Medium: H700-6000M

Medium parameters used (interpolated): f = 829 MHz; σ = 0.892 S/m; εr = 41.242; ρ = 1000 kg/m3

Ambient Temperature:23.3℃ Liquid Temperature: 22.5℃

Communication System: UID 0, LTE Band5 (0) Frequency: 829 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7673 ConvF(10.45, 10.45, 10.45)

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.61 W/kg

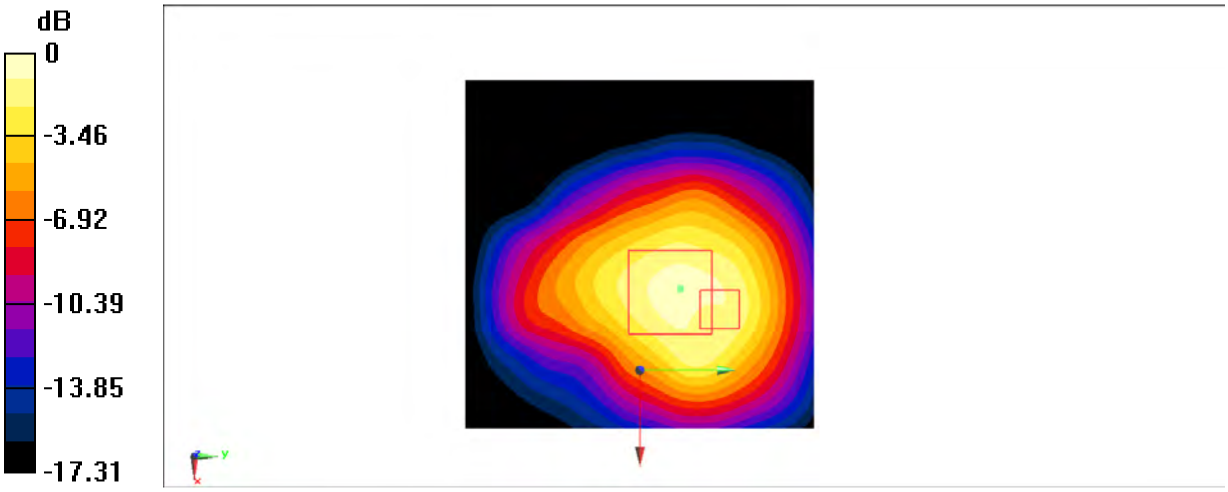
Zoom Scan (5x5x5)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 38.26 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 2.30 W/kg

SAR(1 g) = 1.08 W/kg; SAR(10 g) = 0.609 W/kg

Maximum value of SAR (measured) = 1.84 W/kg



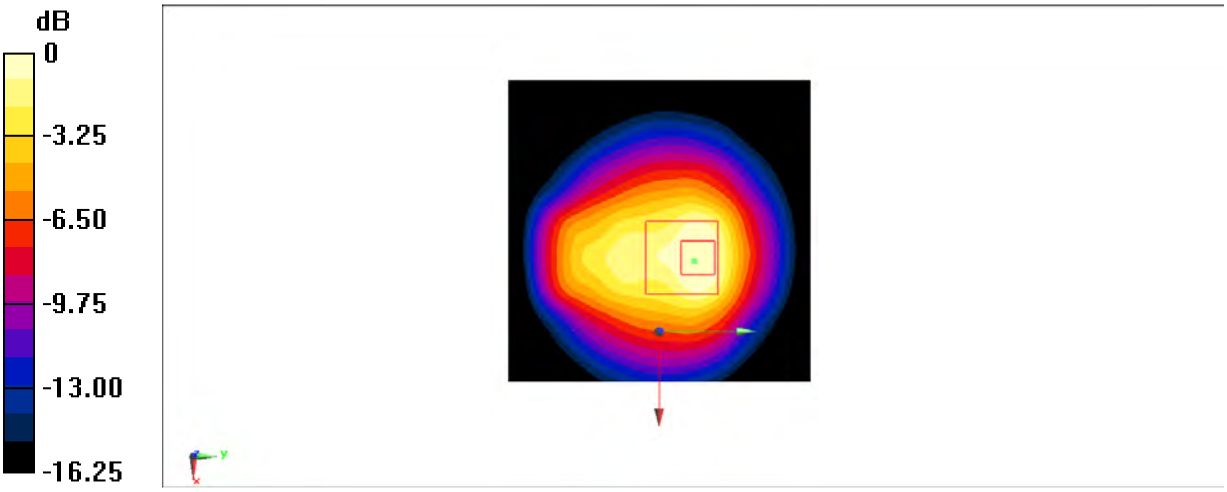
0 dB = 1.84 W/kg = 2.65 dBW/kg

LTE Band12_ Rear 0mm

Date: 2024/9/2
Electronics: DAE4 Sn549
Medium: H700-6000M
Medium parameters used (interpolated): f = 711 MHz; σ = 0.841 S/m; εr = 41.606; ρ = 1000 kg/m3
Ambient Temperature:23.3℃ Liquid Temperature: 22.5℃
Communication System: UID 0, LTE Band12 (0) Frequency: 711 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN7673 ConvF(10.45, 10.45, 10.45)

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.13 W/kg

Zoom Scan (5x5x5)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 42.04 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 2.56 W/kg
SAR(1 g) = 1.15 W/kg; SAR(10 g) = 0.663 W/kg
Maximum value of SAR (measured) = 1.85 W/kg



0 dB = 1.85 W/kg = 2.67 dBW/kg

LTE Band13_ Rear 0mm

Date: 2024/9/2

Electronics: DAE4 Sn549

Medium: H700-6000M

Medium parameters used (interpolated): f = 782 MHz; σ = 0.873 S/m; εr = 41.418; ρ = 1000 kg/m3

Ambient Temperature:23.3℃ Liquid Temperature: 22.5℃

Communication System: UID 0, LTE Band13 (0) Frequency: 782 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7673 ConvF(10.45, 10.45, 10.45)

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 3.39 W/kg

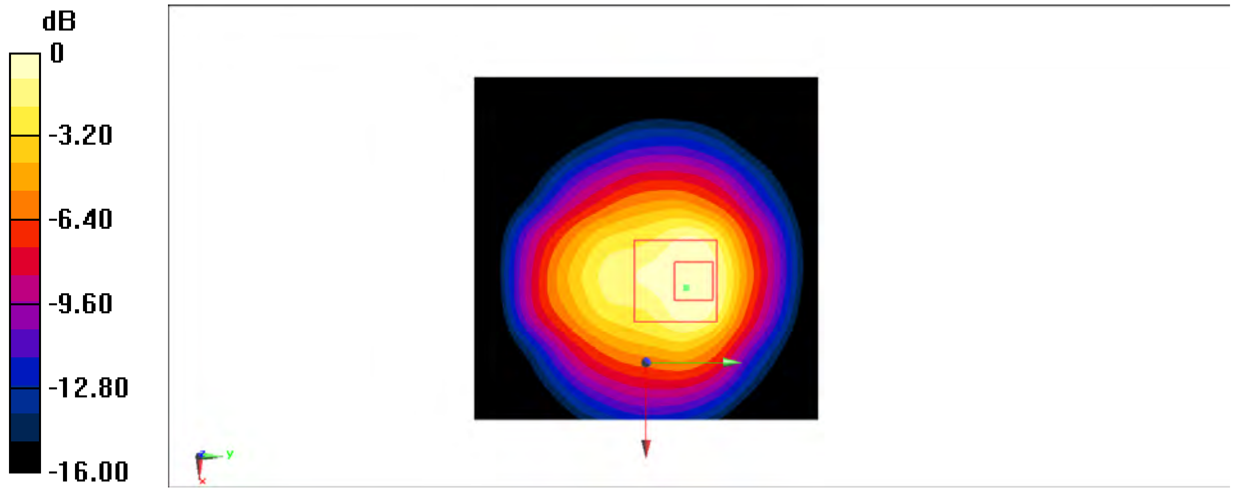
Zoom Scan (5x5x5)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 50.70 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 4.02 W/kg

SAR(1 g) = 1.84 W/kg; SAR(10 g) = 1.06 W/kg

Maximum value of SAR (measured) = 2.70 W/kg



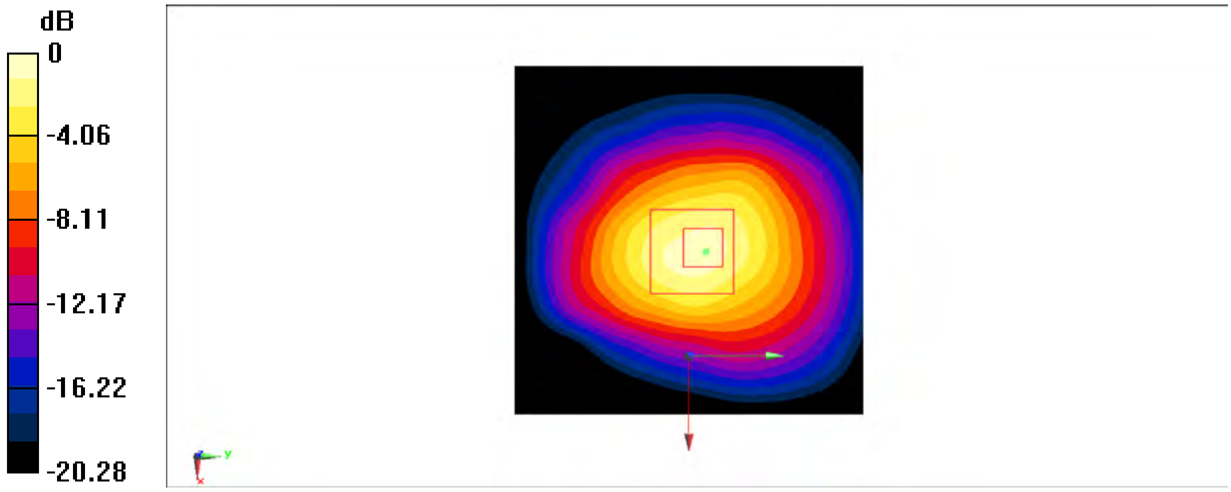
0 dB = 2.70 W/kg = 4.31 dBW/kg

LTE Band25_ Rear 0mm

Date: 2024/9/14
Electronics: DAE4 Sn549
Medium: H700-6000M
Medium parameters used: f = 1905 MHz; σ = 1.445 S/m; εr = 38.791; ρ = 1000 kg/m3
Ambient Temperature:23.3℃ Liquid Temperature: 22.5℃
Communication System: UID 0, LTE Band25 (0) Frequency: 1905 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN7673 ConvF(8.1, 8.1, 8.1)

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 4.44 W/kg

Zoom Scan (5x5x5)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 56.68 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 6.47 W/kg
SAR(1 g) = 3.29 W/kg; SAR(10 g) = 1.76 W/kg
Maximum value of SAR (measured) = 5.28 W/kg



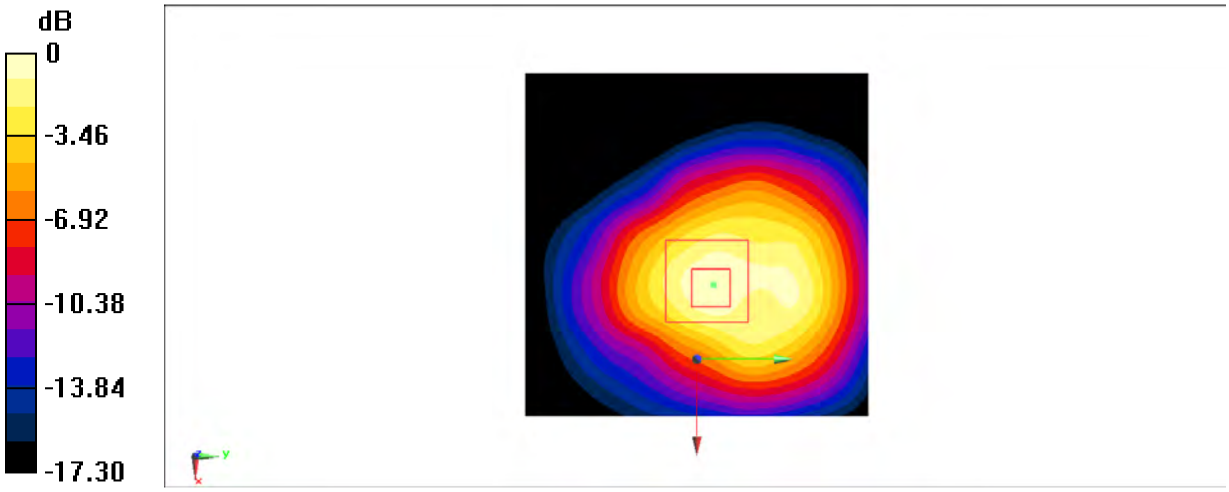
0 dB = 5.28 W/kg = 7.23 dBW/kg

LTE Band66_ Rear 0mm

Date: 2024/9/14
Electronics: DAE4 Sn549
Medium: H700-6000M
Medium parameters used: f = 1745 MHz; σ = 1.347 S/m; εr = 38.991; ρ = 1000 kg/m3
Ambient Temperature:23.3°C Liquid Temperature: 22.5°C
Communication System: UID 0, LTE Band66 (0) Frequency: 1745 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN7673 ConvF(8.45, 8.45, 8.45)

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.48 W/kg

Zoom Scan (5x5x5)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 46.20 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 4.23 W/kg
SAR(1 g) = 2.59 W/kg; SAR(10 g) = 1.45 W/kg
Maximum value of SAR (measured) = 3.58 W/kg



0 dB = 3.58 W/kg = 5.54 dBW/kg

LTE Band71_ Rear 0mm

Date: 2024/9/2

Electronics: DAE4 Sn549

Medium: H700-6000M

Medium parameters used (extrapolated): f = 673 MHz; σ = 0.858 S/m; εr = 41.712; ρ = 1000 kg/m3

Ambient Temperature:23.3℃ Liquid Temperature: 22.5℃

Communication System: UID 0, LTE Band71 (0) Frequency: 673 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7673 ConvF(10.45, 10.45, 10.45)

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.24 W/kg

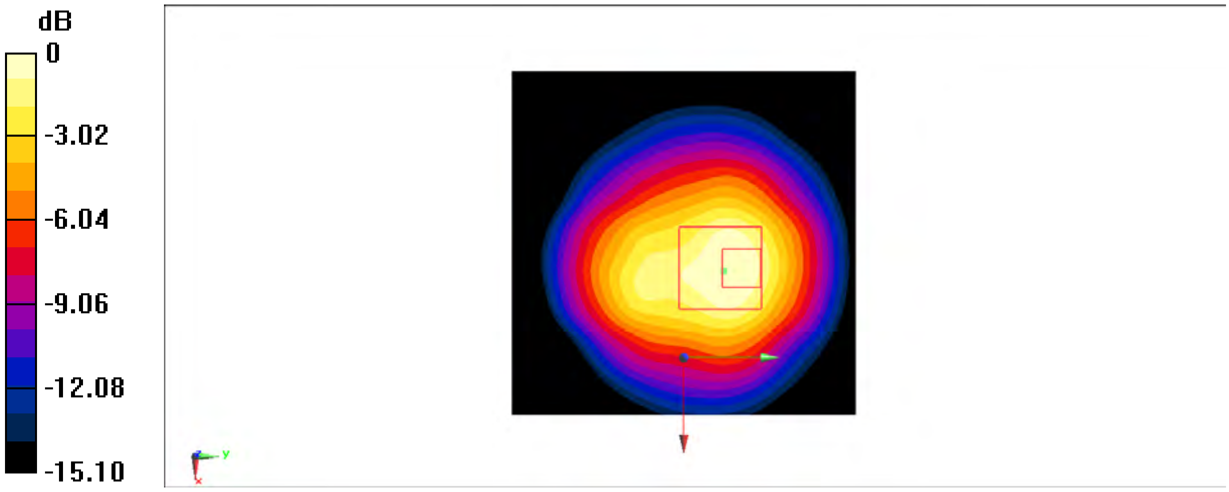
Zoom Scan (5x5x5)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 30.79 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 1.65 W/kg

SAR(1 g) = 0.713 W/kg; SAR(10 g) = 0.422 W/kg

Maximum value of SAR (measured) = 1.13 W/kg



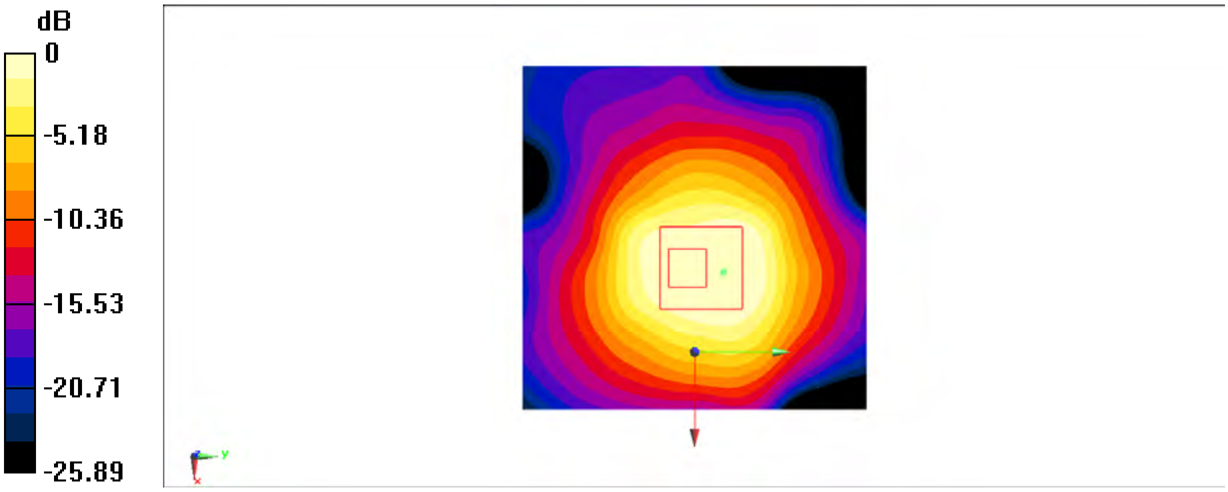
0 dB = 1.13 W/kg = 0.53 dBW/kg

WIFI2.4G_ Rear 0mm

Date: 2024/9/8
Electronics: DAE4 Sn549
Medium: H700-6000M
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.861 S/m; εr = 37.715; ρ = 1000 kg/m3
Ambient Temperature:23.3℃　　Liquid Temperature: 22.5℃
Communication System: UID 0, WLan 2450 (0) Frequency: 2462 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN7673 ConvF(7.6, 7.6, 7.6)

Area Scan (61x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.608 W/kg

Zoom Scan (5x6x5)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.65 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 0.586 W/kg
SAR(1 g) = 0.274 W/kg; SAR(10 g) = 0.152 W/kg
Maximum value of SAR (measured) = 0.443 W/kg



0 dB = 0.443 W/kg = -3.54 dBW/kg

ANNEX B System Verification Results

750 MHz

Date: 2024/9/2

Electronics: DAE4 Sn549

Medium: H700-6000M

Medium parameters used: f = 750 MHz; σ = 0.857 S/m; εr = 41.55; ρ = 1000 kg/m3

Ambient Temperature:23.3°C Liquid Temperature: 22.5°C

Communication System: CW (0) Frequency: 750 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7673 ConvF(10.45, 10.45, 10.45)

Area Scan (131x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 2.93 W/kg

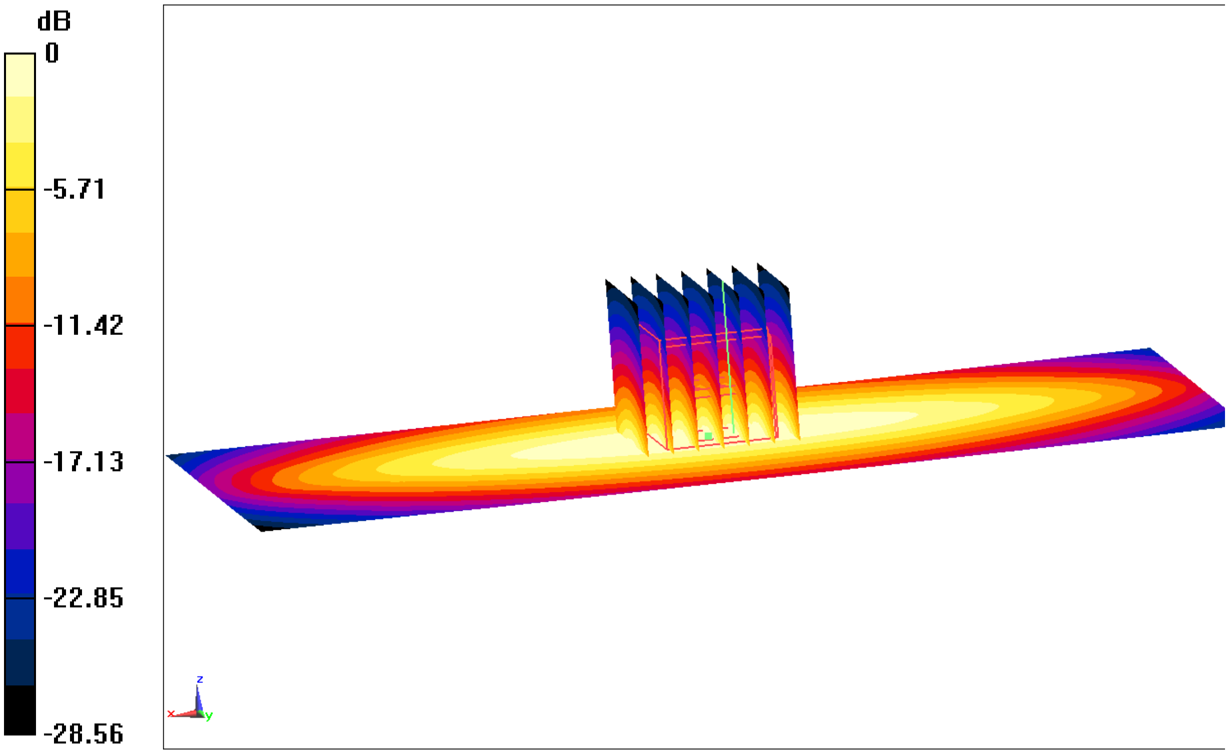
Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.68 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 3.38 W/kg

SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.41 W/kg

Maximum value of SAR (measured) = 2.91 W/kg



0 dB = 2.91 W/kg = 4.64 dBW/kg

835 MHz

Date: 2024/9/2

Electronics: DAE4 Sn549

Medium: H700-6000M

Medium parameters used: f = 835 MHz; σ = 0.894 S/m; εr = 41.22; ρ = 1000 kg/m3

Ambient Temperature:23.3°C   Liquid Temperature: 22.5°C

Communication System: UID 0, CW (0) Frequency: 835 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7673 ConvF(10.45, 10.45, 10.45)

Area Scan (131x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 3.08 W/kg

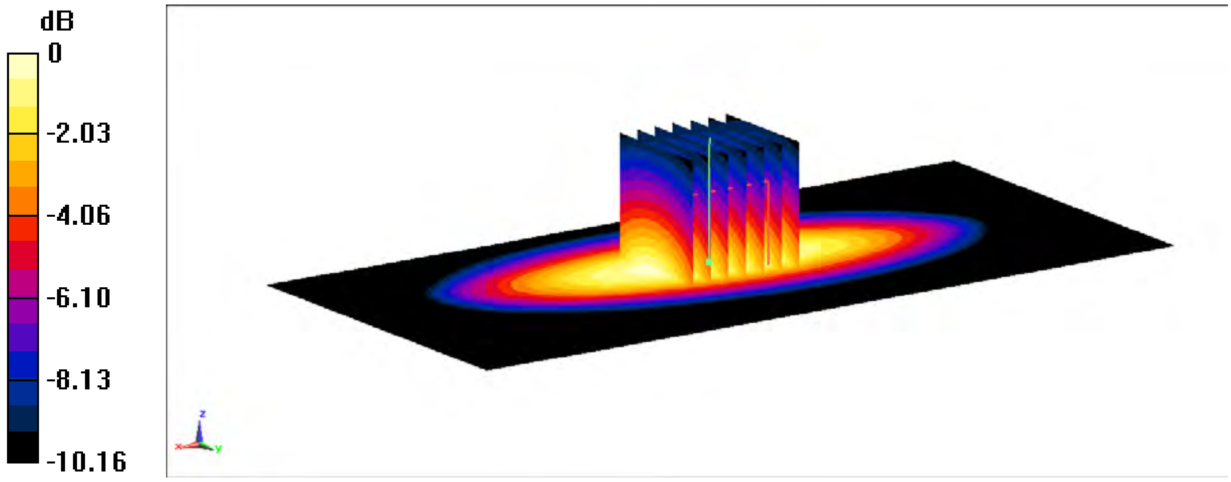
Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.02 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 3.44 W/kg

SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.57 W/kg

Maximum value of SAR (measured) = 3.11 W/kg



0 dB = 3.11 W/kg = 4.93 dBW/kg

1750 MHz

Date: 2024/9/14

Electronics: DAE4 Sn549

Medium: H700-6000M

Medium parameters used: f = 1750 MHz; σ = 1.35 S/m; εr = 38.98; ρ = 1000 kg/m3

Ambient Temperature:23.3℃ Liquid Temperature: 22.5℃

Communication System: CW (0) Frequency: 1750 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7673 ConvF(8.45, 8.45, 8.45)

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 14.3 W/kg

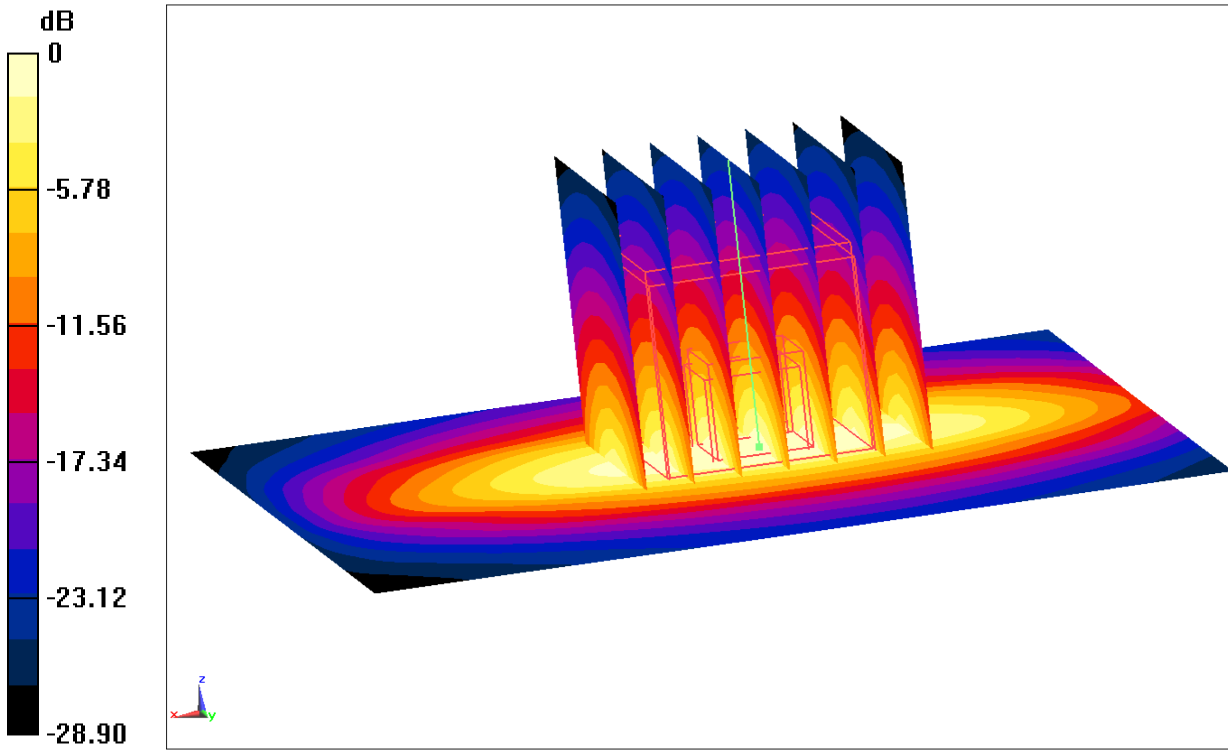
Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.02 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 17.7 W/kg

SAR(1 g) = 9.14 W/kg; SAR(10 g) = 4.79 W/kg

Maximum value of SAR (measured) = 14.5 W/kg



0 dB = 14.2 W/kg = 11.52 dBW/kg

1900 MHz

Date: 2024/9/14

Electronics: DAE4 Sn549

Medium: H700-6000M

Medium parameters used: f = 1900 MHz; σ = 1.441 S/m; εr = 38.8; ρ = 1000 kg/m3

Ambient Temperature:23.3℃ Liquid Temperature: 22.5℃

Communication System: CW (0) Frequency: 1900 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7673 ConvF(8.1, 8.1, 8.1)

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 16.1 W/kg

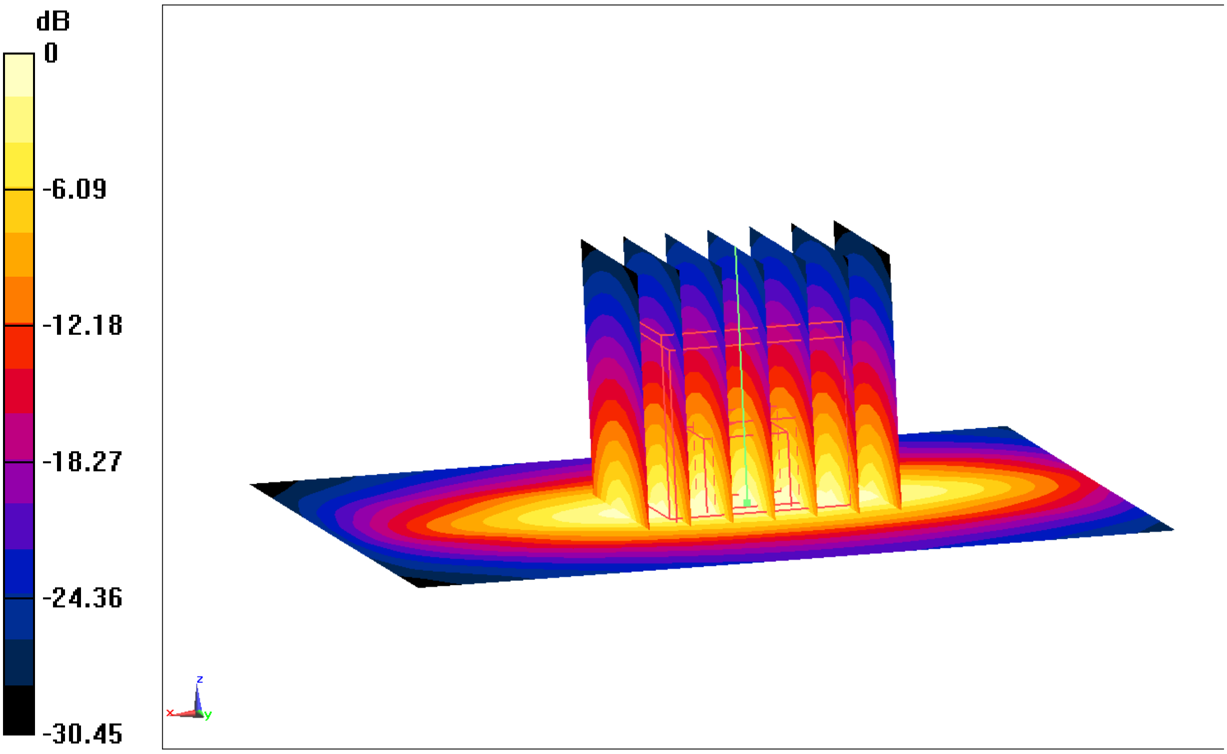
Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.3 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 19.5 W/kg

SAR(1 g) = 9.95 W/kg; SAR(10 g) = 5.11 W/kg

Maximum value of SAR (measured) = 15.8 W/kg



0 dB = 16.0 W/kg = 12.04 dBW/kg

2450 MHz

Date: 2024/9/8

Electronics: DAE4 Sn549

Medium: H700-6000M

Medium parameters used: f = 2450 MHz; σ = 1.852 S/m; εr = 37.74; ρ = 1000 kg/m3

Ambient Temperature:23.3oC Liquid Temperature: 22.5oC

Communication System: CW (0) Frequency: 2450 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7673 ConvF(7.6, 7.6, 7.6)

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 22.5 W/kg

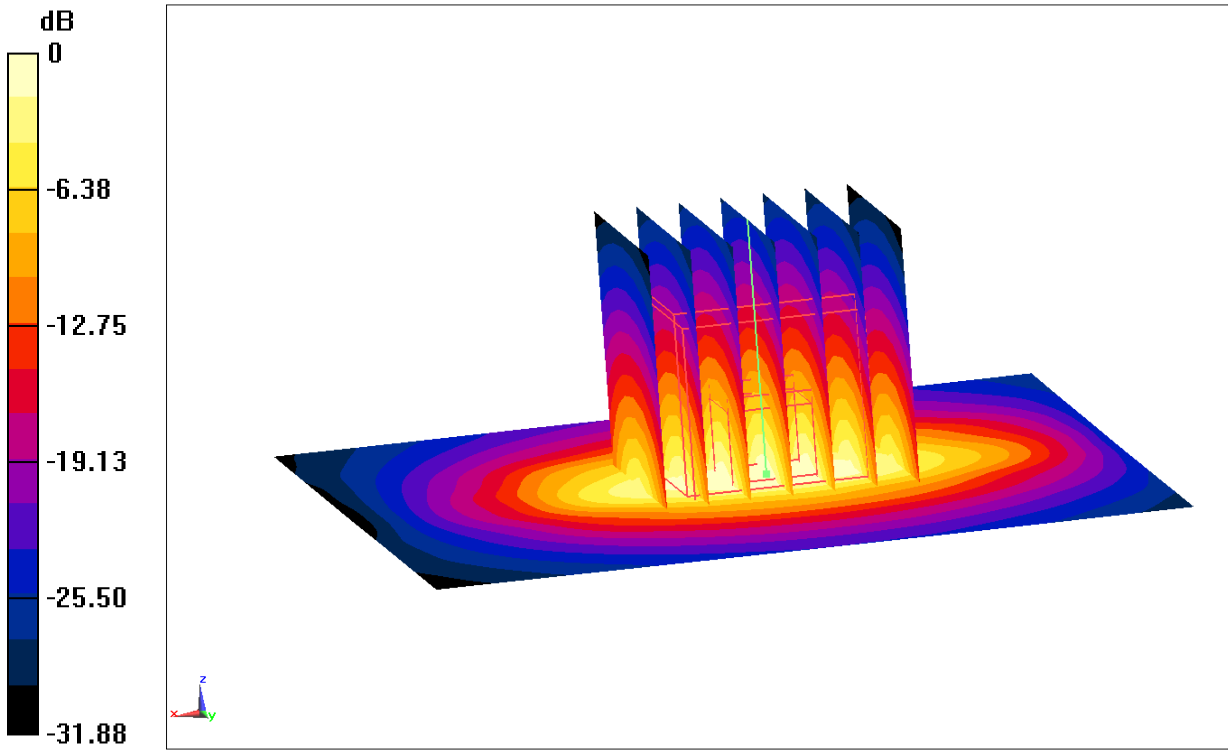
Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 104.5 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 28.2 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.14 W/kg

Maximum value of SAR (measured) = 22.6 W/kg

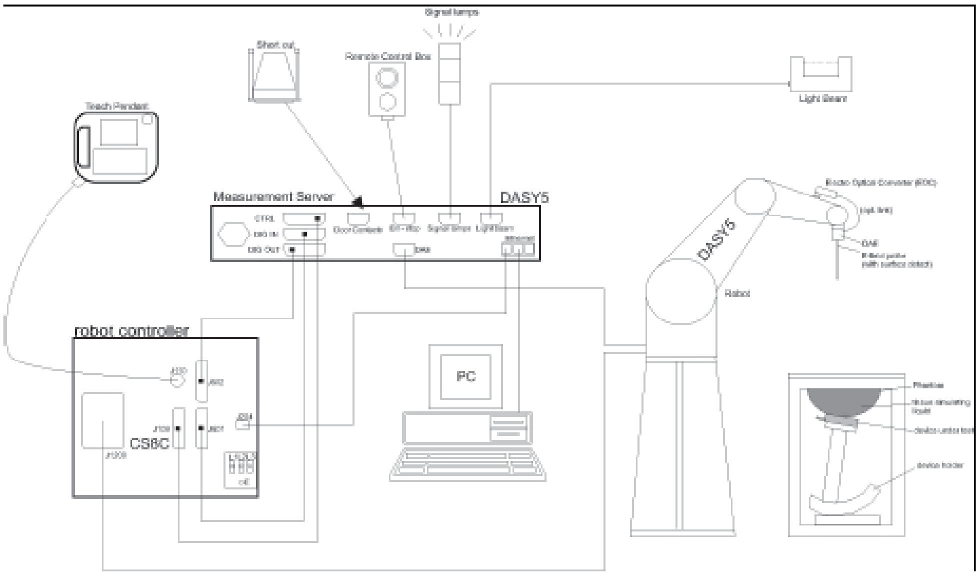


0 dB = 22.4 W/kg = 13.50 dBW/kg

ANNEX C SAR Measurement Setup

C.1 Measurement Set-up

The Dasy5 or DASY6 system for performing compliance tests is illustrated above graphically. This system consists of the following items:



Picture C.1SAR Lab Test Measurement Set-up

- A standard high precision 6-axis robot (StäubliTX=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 WinXP and the DASY5 or DASY6 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.

C.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 or DASY6 software reads the reflection durning a software approach and looks for the maximum using 2nd ord curve fitting. The approach is stopped at reaching the maximum.

Picture C.2Near-field Probe

Probe Specifications:

Model: ES3DV3, EX3DV4

Frequency Range: 10MHz — 6.0GHz(EX3DV4)
10MHz — 4GHz(ES3DV3)

Calibration: In head and body simulating tissue at Frequencies from 835 up to 5800MHz

Linearity: ± 0.2 dB(30 MHz to 6 GHz) for EX3DV4
± 0.2 dB(30 MHz to 4 GHz) for ES3DV3

DynamicRange: 10 mW/kg — 100W/kg

Probe Length: 330 mm

Probe Tip Length: 20 mm

Body Diameter: 12 mm

Tip Diameter: 2.5 mm (3.9 mm for ES3DV3)

Tip-Center: 1 mm (2.0mm for ES3DV3)

Application: SAR Dosimetry Testing
Compliance tests ofmobile phones
Dosimetry in strong gradient fields

Picture C.3E-field Probe

C.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 equates 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).

C.4 Other Test Equipment

C.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.

PictureC.4: DAE

C.4.2 Robot

The SPEAG DASY system uses the high precision robots (DASY5: RX160L) 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 C.5 DASY 5

C.4.3 Measurement Server

The Measurement server is based on a PC/104 CPU broad with CPU (DASY5: 400 MHz, Intel Celeron), chipdisk (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.

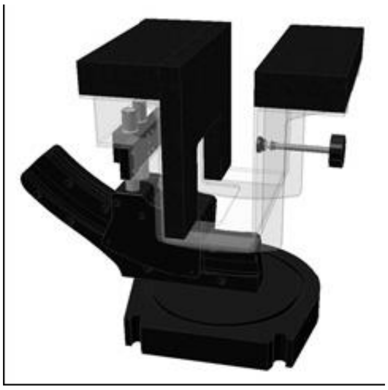
The measurement server performs all real-time data evaluation of field measurements and surface detection, controls robot movements and handles safety operation. The PC operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection 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.

Picture C.6 Server for DASY 5

C.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 C7-1: Device Holder



Picture C.7-2: Laptop Extension Kit

C.4.5 Phantom

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a table. The shape of the shell is based on data from an anatomical study designed to
Represent the 90th percentile of the population. The phantom enables the dissymmetric evaluation of SAR for both left and right handed handset usage, as well as body-worn usage using the flat phantom region. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. The shell phantom has a 2mm shell thickness (except the ear region where shell thickness increases to 6 mm).
Shell Thickness: 2±0. 2 mm
Filling Volume: Approx. 25 liters
Dimensions: 810 x l000 x 500 mm (H x L x W)
Available: Special

Picture C.8: SAM Twin Phantom

ANNEX D Position of the wireless device in relation to the phantom

D.1 Limb-worn device

A limb-worn device is a unit whose intended use includes being strapped to the arm or leg of the user while transmitting (except in idle mode). It is similar to a body-worn device. Therefore, the test positions of 6.1.4.4 also apply. The strap shall be opened so that it is divided into two parts as shown in Figure 10. The device shall be positioned directly against the phantom surface with the strap straightened as much as possible and the back of the device towards the phantom.

If the strap cannot normally be opened to allow placing in direct contact with the phantom surface, it may be necessary to break the strap of the device but ensuring to not damage the antenna.

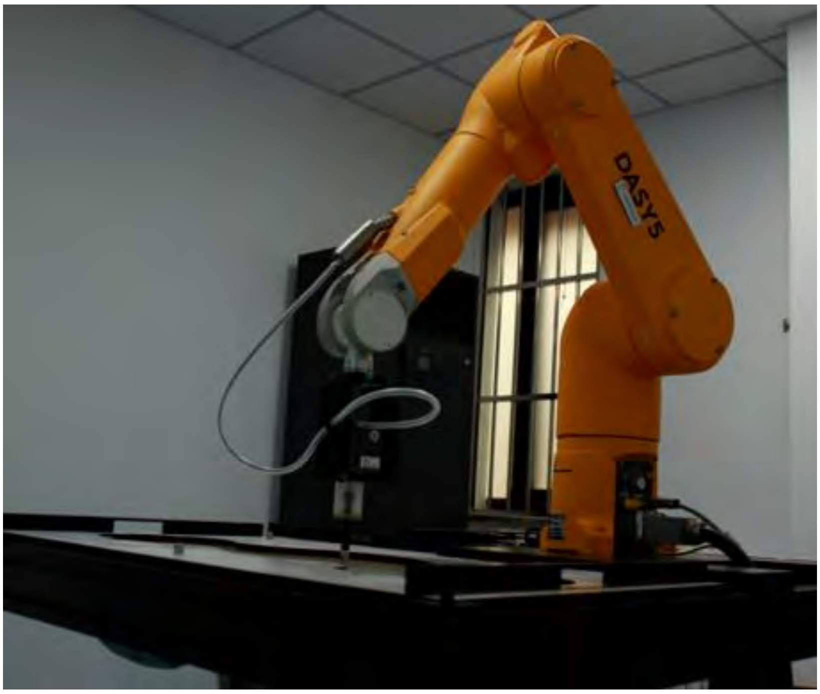
Picture D.1 Test position for limb-worn devices

D.2 Front-of-face device

A typical example of a front-of-face device is a two-way radio that is held at a distance from the face of the user when transmitting. In these cases the device under test 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 (Figure 9a). If the intended use is not specified, a separation distance of 25 mm[5] between the phantom surface and the device shall be used.

Picture D.2 Test position for front-of-face devices

D.3 DUT Setup Photos



Picture D.3

ANNEX E Equivalent Media Recipes

The liquid used for the frequency range of 800-3000 MHz consisted of water, sugar, salt, preventol, glycol monobutyl and Cellulose. The liquid has been previously proven to be suited for worst-case. The Table E.1 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528 and IEC 62209.

TableE.1: Composition of the Tissue Equivalent Matter

Frequency (MHz)	835Head	835Body	1900 Head	1900 Body	2450 Head	2450 Body	5800 Head	5800 Body
Ingredients (% by weight)								
Water	41.45	52.5	55.242	69.91	58.79	72.60	65.53	65.53
Sugar	56.0	45.0	\	\	\	\	\	\
Salt	1.45	1.4	0.306	0.13	0.06	0.18	\	\
Preventol	0.1	0.1	\	\	\	\	\	\
Cellulose	1.0	1.0	\	\	\	\	\	\
Glycol Monobutyl	\	\	44.452	29.96	41.15	27.22	\	\
Diethylenglycol monohexylether	\	\	\	\	\	\	17.24	17.24
Triton X-100	\	\	\	\	\	\	17.24	17.24
Dielectric Parameters Target Value	ε=41.5 σ=0.90	ε=55.2 σ=0.97	ε=40.0 σ=1.40	ε=53.3 σ=1.52	ε=39.2 σ=1.80	ε=52.7 σ=1.95	ε=35.3 σ=5.27	ε=48.2 σ=6.00

Note: There are a little adjustment respectively for 750, 1750, 2600, 5200, 5300 and 5600 based on the recipe of closest frequency in table E.1.

ANNEX F System Validation

The SAR system must be validated against its performance specifications before it is deployed. When SAR probes, system components or software are changed, upgraded or recalibrated, these must be validated with the SAR system(s) that operates with such components.

Table F.1: System Validation for 7673

Probe SN.	Liquid name	Validation date	Frequency point	Status (OK or Not)
7673	Head 750MHz	July.30,2024	750 MHz	OK
7673	Head 900MHz	July.30,2024	900 MHz	OK
7673	Head 1750MHz	July.30,2024	1750 MHz	OK
7673	Head 1900MHz	July.30,2024	1900 MHz	OK
7673	Head 2000MHz	July.30,2024	2000 MHz	OK
7673	Head 2300MHz	July.30,2024	2300 MHz	OK
7673	Head 2450MHz	July.30,2024	2450 MHz	OK
7673	Head 2600MHz	July.30,2024	2600 MHz	OK
7673	Head 3500MHz	July.30,2024	3500 MHz	OK
7673	Head 3700MHz	July.30,2024	3700 MHz	OK
7673	Head 5250MHz	July.30,2024	5250 MHz	OK
7673	Head 5600MHz	July.30,2024	5600 MHz	OK
7673	Head 5750MHz	July.30,2024	5750 MHz	OK

ANNEX G Probe Calibration Certificate

Probe 7673 Calibration Certificate

In Collaboration with
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CALIBRATION LABORATORY

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中国认可 国际互认 校准 CALIBRATION CNAS L0570

Client CTTL Certificate No: 24J02Z000429

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN : 7673
Calibration Procedure(s)	FF-Z11-004-02 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	July 29, 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
Power Meter NRP2	106277	19-Oct-23(CTTL, No.J23X11026)	Oct-24
Power sensor NRP8S	104291	19-Oct-23(CTTL, No.J23X11026)	Oct-24
Power sensor NRP8S	104292	19-Oct-23(CTTL, No.J23X11026)	Oct-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 7307	28-May-24(SPEAG, No.EX-7307_May24)	May-25
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-24(CTTL, No.24J02X005419)	Jun-25
SignalGenerator APSIN26G	181-33A6D0700-1959	26-Mar-24(CTTL, No.24J02X002468)	Mar-25
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: August 05, 2024

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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:7673

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (*k*=2)
Norm(μV/(V/m)^2)[A]	0.62	0.63	0.60	±10.0%
DCP(mV)[B]	109.4	111.6	108.0	

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	214.8	±2.1%
		Y	0.0	0.0	1.0		218.1	
		Z	0.0	0.0	1.0		207.9	

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:7673

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	10.45	10.45	10.45	0.23	1.09	±12.7%
900	41.5	0.97	10.03	10.03	10.03	0.21	1.24	±12.7%
1450	40.5	1.20	8.74	8.74	8.74	0.18	1.04	±12.7%
1750	40.1	1.37	8.45	8.45	8.45	0.25	1.02	±12.7%
1900	40.0	1.40	8.10	8.10	8.10	0.25	1.04	±12.7%
2000	40.0	1.40	8.15	8.15	8.15	0.26	1.05	±12.7%
2300	39.5	1.67	7.85	7.85	7.85	0.58	0.69	±12.7%
2450	39.2	1.80	7.60	7.60	7.60	0.57	0.71	±12.7%
2600	39.0	1.96	7.44	7.44	7.44	0.64	0.67	±12.7%
3300	38.2	2.71	6.93	6.93	6.93	0.47	0.88	±13.9%
3500	37.9	2.91	6.73	6.73	6.73	0.45	1.00	±13.9%
3700	37.7	3.12	6.48	6.48	6.48	0.35	1.20	±13.9%
3900	37.5	3.32	6.44	6.44	6.44	0.30	1.52	±13.9%
4100	37.2	3.53	6.43	6.43	6.43	0.35	1.25	±13.9%
4200	37.1	3.63	6.33	6.33	6.33	0.30	1.52	±13.9%
4400	36.9	3.84	6.23	6.23	6.23	0.30	1.52	±13.9%
4600	36.7	4.04	6.18	6.18	6.18	0.35	1.40	±13.9%
4800	36.4	4.25	6.07	6.07	6.07	0.35	1.55	±13.9%
4950	36.3	4.40	5.74	5.74	5.74	0.35	1.55	±13.9%
5250	35.9	4.71	5.18	5.18	5.18	0.40	1.52	±13.9%
5600	35.5	5.07	4.60	4.60	4.60	0.40	1.52	±13.9%
5750	35.4	5.22	4.71	4.71	4.71	0.40	1.55	±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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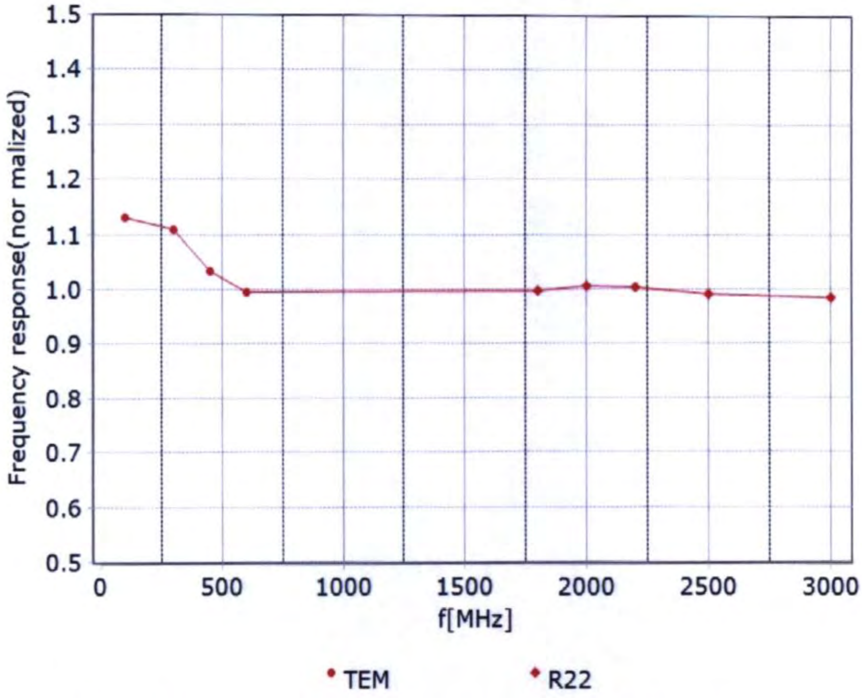
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



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

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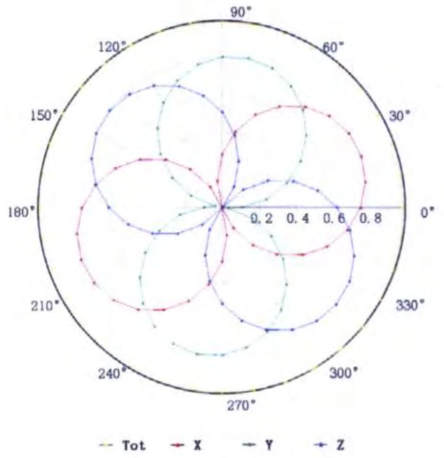
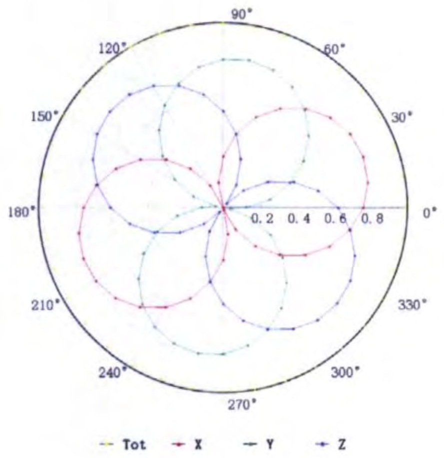
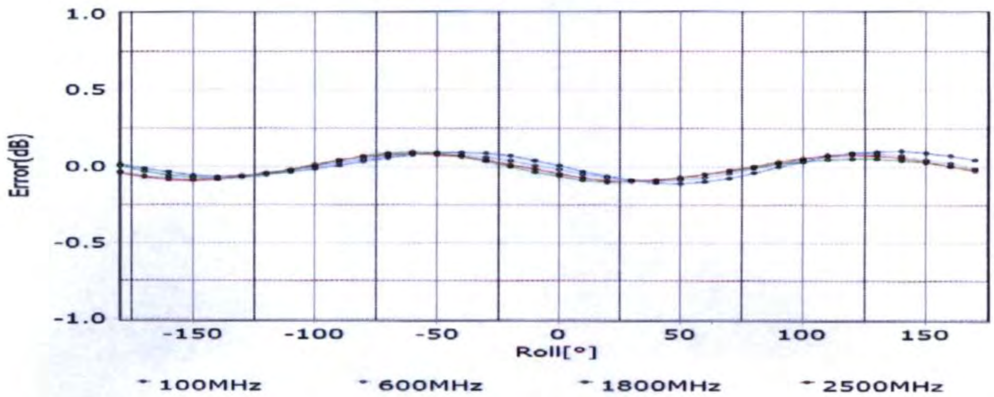
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





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

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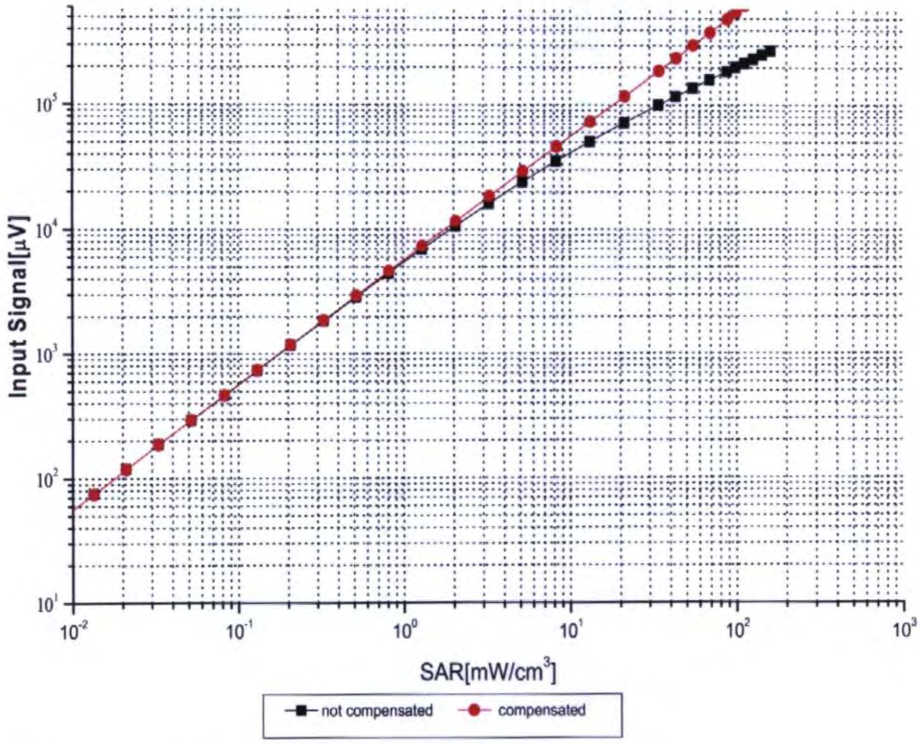
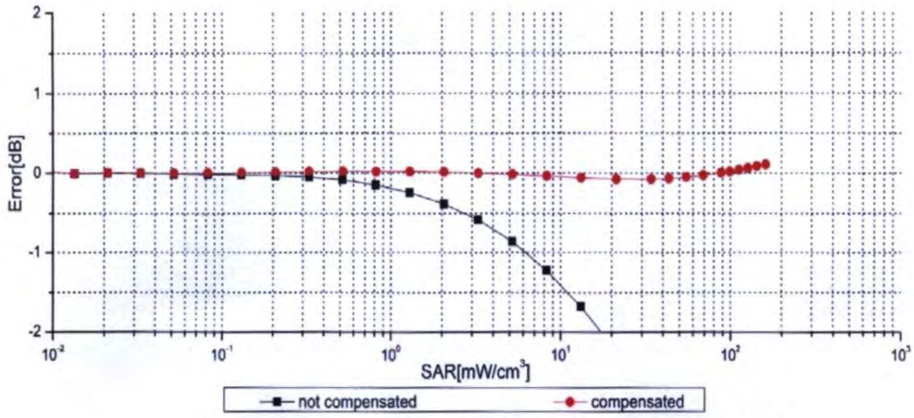
Dynamic Range f(SAR$_{head}$)
(TEM cell, f = 900 MHz)





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

Certificate No:24J02Z000429 Page 7 of 9

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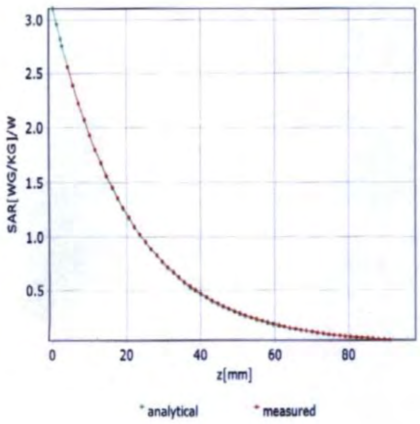
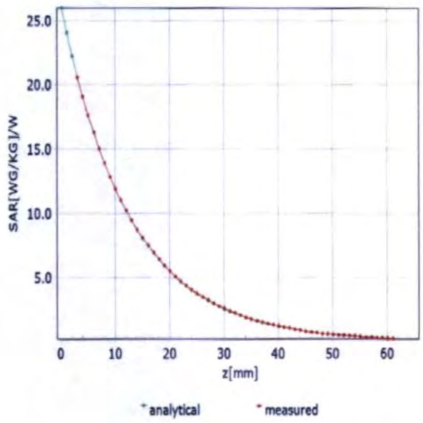
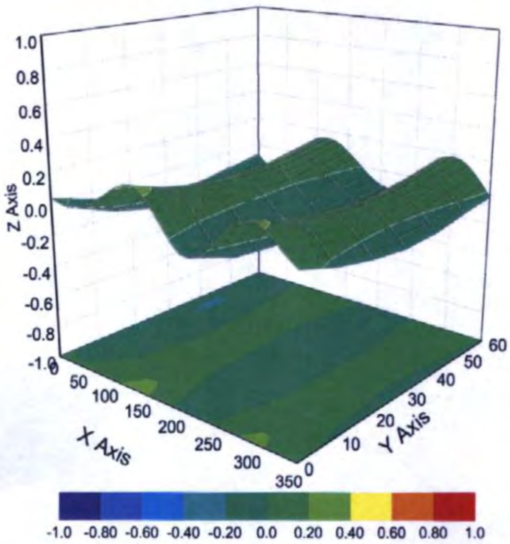
Conversion Factor Assessment

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:7673

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	146.2
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

ANNEX H Dipole Calibration Certificate

750 MHz Dipole Calibration Certificate

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S **Schweizerischer Kalibrierdienst**
C **Service suisse d'étalonnage**
S **Servizio svizzero di taratura**
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client **CTTL**
Beijing

Certificate No. **D750V3-1017_Jul24**

CALIBRATION CERTIFICATE

Object: D750V3 - SN: 1017

Calibration procedure(s): QA CAL-05.v12
Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz

Calibration date: July 9, 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 (Certificate No.)	Scheduled Cal
Power Sensor R&S NRP-33T	SN: 100967	28-Mar-24 (No. 217-04038)	Mar-25
Power Sensor R&S NRP18A	SN: 101859	21-Mar-24 (No. 4030A315007801)	Mar-25
Spectrum Analyzer R&S FSV40	SN: 101832	25-Jan-24 (No. 4030-315007551)	Jan-25
Mismatch; Short [S4188] Attenuator [S4423]	SN: 1152	28-Mar-24 (No. 217-04050)	Mar-25
OCP DAK-12	SN: 1016	05-Oct-23 (No. OCP-DAK12-1016_Oct23)	Oct-24
OCP DAK-3.5	SN: 1249	05-Oct-23 (No. OCP-DAK3.5-1249_Oct23)	Oct-24
Reference Probe EX3DV4	SN: 7349	03-Jun-24 (No. EX3-7349_Jun24)	Jun-25
DAE4ip	SN: 1836	10-Jan-24 (No. DAE4ip-1836_Jan24)	Jan-25

Secondary Standards	ID	Check Date (in house)	Scheduled Check
ACAD Source Box	SN: 1000	28-May-24 (No. 675-ACAD_Source_Box-240528)	May-25
Signal Generator R&S SMB100A	SN: 182081	28-May-24 (No. 0001-300719404)	May-25
Mismatch; SMA	SN: 1102	22-May-24 (No. 675-Mismatch_SMA-240522)	May-25

	Name	Function	Signature
Calibrated by	Paulo Pina	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: July 9, 2024

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

Certificate No: D750V3-1017_Jul24 Page 1 of 6

Calibration Laboratory of
Schmid & Partner
Engineering AG
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Accreditation No.: **SCS 0108**

Glossary

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

Calibration is Performed According to the Following Standards

- IEC/IEEE 62209-1528,"Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation

- DASY 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%.

Measurement Conditions

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

DASY Version	DASY8 Module SAR	16.4.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with spacer
Zoom Scan Resolution	dx, dy = 6mm, dz = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	750MHz ±1MHz	

Head TSL parameters at 750 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.890 mho/m
Measured Head TSL parameters	(22.0 ±0.2)°C	42.5 ±6%	0.910 mho/m ±6%
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 750 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	2.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.52 W/kg ±17.0% (*k* = 2)

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	1.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.53 W/kg ±16.5% (*k* = 2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 750 MHz

Impedance	53.2 Ω – 0.7 jΩ
Return Loss	-30.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.034 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

System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D750V3 - SN1017	750	HSL	24

Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	15		CW, 0--	750, 0	9.9	0.91	42.5

Hardware Setup

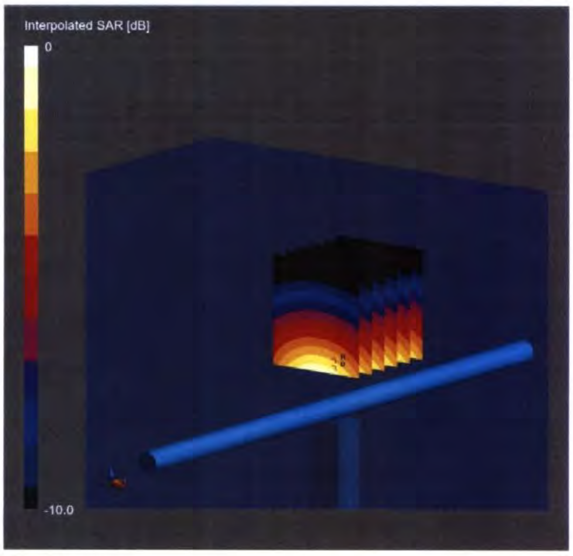
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Flat V4.9 mod	HSL, 2024-07-09	EX3DV4 - SN7349, 2024-06-03	DAE4ip Sn1836, 2024-01-10

Scans Setup

	Zoom Scan
Grid Extents [mm]	30 x 30 x 30
Grid Steps [mm]	6.0 x 6.0 x 1.5
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	VMS + 6p
Scan Method	Measured

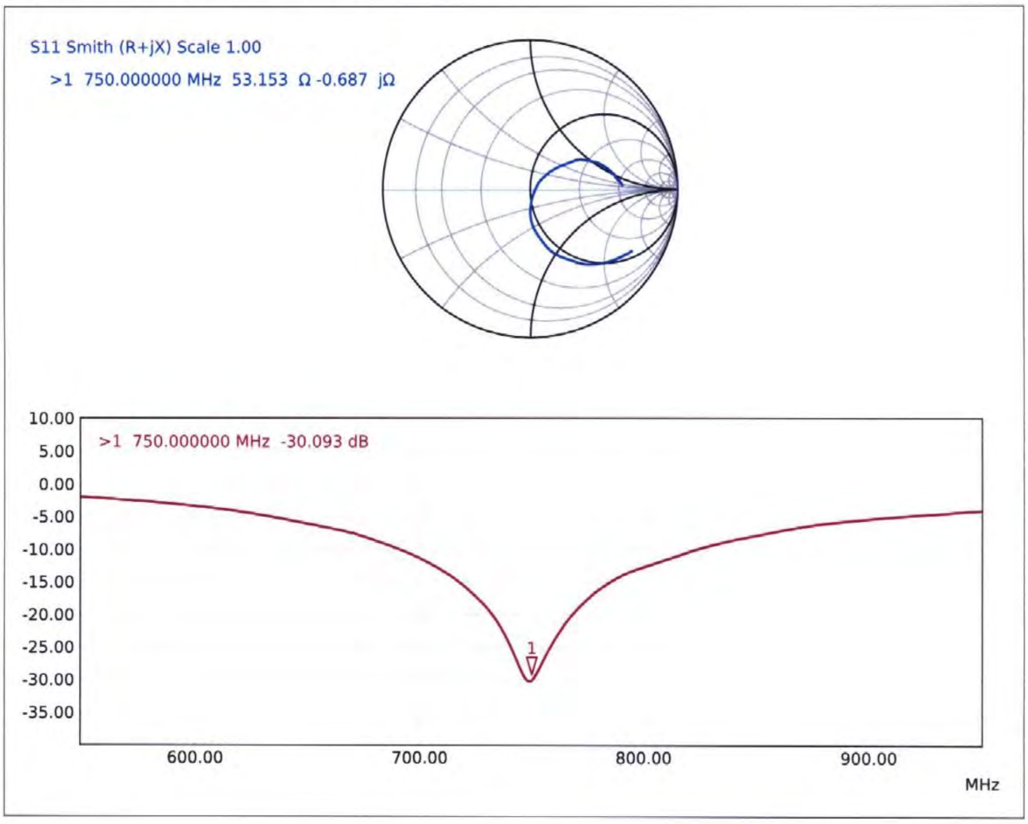
Measurement Results

	Zoom Scan
Date	2024-07-09
psSAR1g [W/Kg]	2.14
psSAR10g [W/Kg]	1.39
Power Drift [dB]	0.00
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



0 dB = 3.48 W/Kg

Impedance Measurement Plot for Head TSL



835 MHz Dipole Calibration Certificate

Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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S **Swiss Calibration Service**

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Accreditation No.: SCS 0108

Client **CTTL** **Beijing**

Certificate No. **D835V2-4d069_Jul24**

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d069
Calibration procedure(s)	QA CAL-05.v12 Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz
Calibration date	July 9, 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 (Certificate No.)	Scheduled Cal
Power Sensor R&S NRP-33T	SN: 100967	28-Mar-24 (No. 217-04038)	Mar-25
Power Sensor R&S NRP18A	SN: 101859	21-Mar-24 (No. 4030A315007801)	Mar-25
Spectrum Analyzer R&S FSV40	SN: 101832	25-Jan-24 (No. 4030-315007551)	Jan-25
Mismatch; Short [S4188] Attenuator [S4423]	SN: 1152	28-Mar-24 (No. 217-04050)	Mar-25
OCP DAK-12	SN: 1016	05-Oct-23 (No. OCP-DAK12-1016_Oct23)	Oct-24
OCP DAK-3.5	SN: 1249	05-Oct-23 (No. OCP-DAK3.5-1249_Oct23)	Oct-24
Reference Probe EX3DV4	SN: 7349	03-Jun-24 (No. EX3-7349_Jun24)	Jun-25
DAE4ip	SN: 1836	10-Jan-24 (No. DAE4ip-1836_Jan24)	Jan-25

Secondary Standards	ID	Check Date (in house)	Scheduled Check
ACAD Source Box	SN: 1000	28-May-24 (No. 675-ACAD_Source_Box-240528)	May-25
Signal Generator R&S SMB100A	SN: 182081	28-May-24 (No. 0001-300719404)	May-25
Mismatch; SMA	SN: 1102	22-May-24 (No. 675-Mismatch_SMA-240522)	May-25

	Name	Function	Signature
Calibrated by	Paulo Pina	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: July 9, 2024

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

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Accreditation No.: **SCS 0108**

Glossary

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

Calibration is Performed According to the Following Standards

- IEC/IEEE 62209-1528,"Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation

- DASY 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%.

Measurement Conditions

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

DASY Version	DASY8 Module SAR	16.4.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with spacer
Zoom Scan Resolution	dx, dy = 6mm, dz = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	835MHz ±1MHz	

Head TSL parameters at 835 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.900 mho/m
Measured Head TSL parameters	(22.0 ±0.2)°C	42.3 ±6%	0.930 mho/m ±6%
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 835 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.47 W/kg ±17.0% (*k* = 2)

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	1.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.09 W/kg ±16.5% (*k* = 2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 835 MHz

Impedance	51.1 Ω – 4.5 jΩ
Return Loss	-26.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.393 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

System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D835V2 - SN4d069	835	HSL	24

Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	15		CW, 0--	835, 0	9.61	0.93	42.3

Hardware Setup

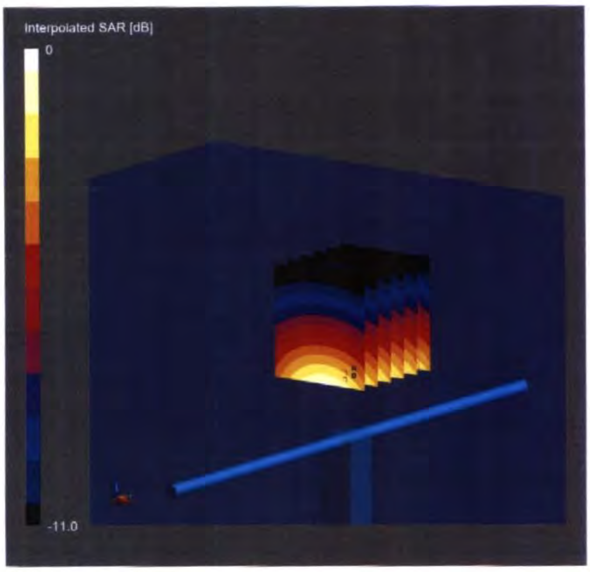
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Flat V4.9 mod	HSL, 2024-07-09	EX3DV4 - SN7349, 2024-06-03	DAE4ip Sn1836, 2024-01-10

Scans Setup

	Zoom Scan
Grid Extents [mm]	30 x 30 x 30
Grid Steps [mm]	6.0 x 6.0 x 1.5
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	VMS + 6p
Scan Method	Measured

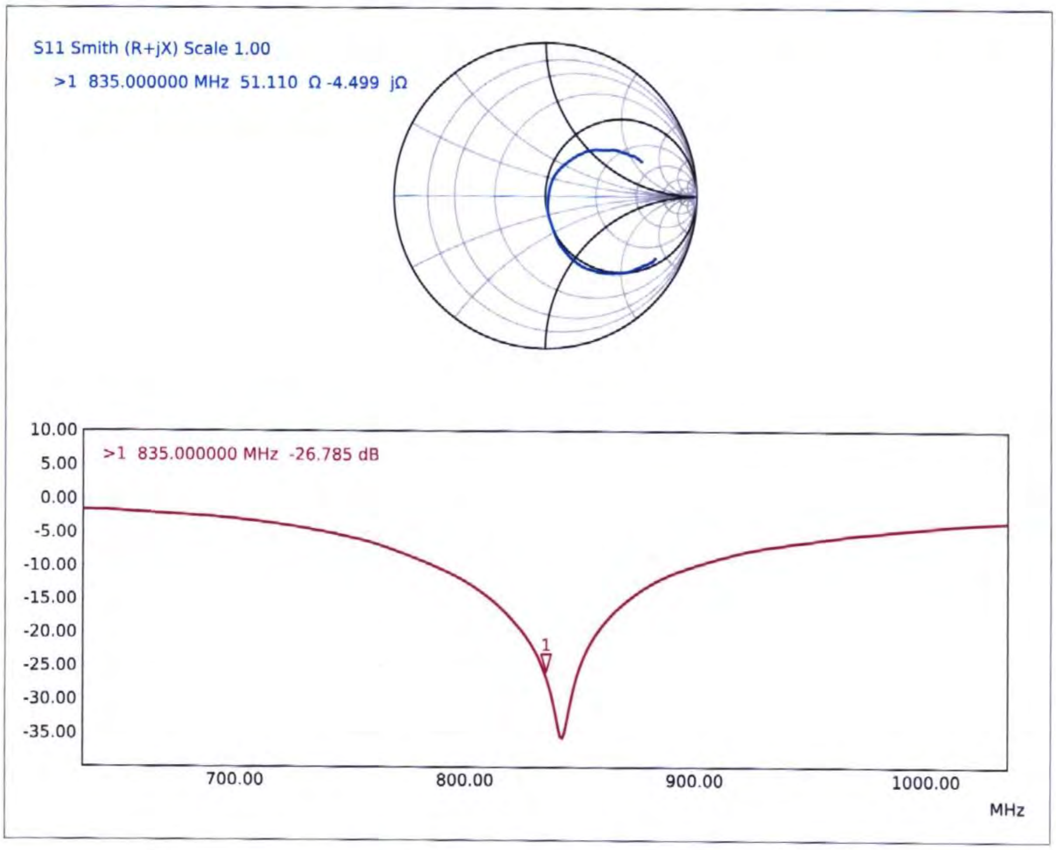
Measurement Results

	Zoom Scan
Date	2024-07-09
psSAR1g [W/Kg]	2.38
psSAR10g [W/Kg]	1.53
Power Drift [dB]	0.00
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



0 dB = 3.85 W/Kg

Impedance Measurement Plot for Head TSL



1750 MHz Dipole Calibration Certificate

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Accreditation No.: SCS 0108

Client **CTTL**
Beijing

Certificate No. **D1750V2-1003_Jul24**

CALIBRATION CERTIFICATE

Object	D1750V2 - SN: 1003
Calibration procedure(s)	QA CAL-05.v12 Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz
Calibration date	July 11, 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 (Certificate No.)	Scheduled Cal
Power Sensor R&S NRP-33T	SN: 100967	28-Mar-24 (No. 217-04038)	Mar-25
Power Sensor R&S NRP18A	SN: 101859	21-Mar-24 (No. 4030A315007801)	Mar-25
Spectrum Analyzer R&S FSV40	SN: 101832	25-Jan-24 (No. 4030-315007551)	Jan-25
Mismatch; Short [S4188] Attenuator [S4423]	SN: 1152	28-Mar-24 (No. 217-04050)	Mar-25
OCP DAK-12	SN: 1016	05-Oct-23 (No. OCP-DAK12-1016_Oct23)	Oct-24
OCP DAK-3.5	SN: 1249	05-Oct-23 (No. OCP-DAK3.5-1249_Oct23)	Oct-24
Reference Probe EX3DV4	SN: 7349	03-Jun-24 (No. EX3-7349_Jun24)	Jun-25
DAE4ip	SN: 1836	10-Jan-24 (No. DAE4ip-1836_Jan24)	Jan-25

Secondary Standards	ID	Check Date (in house)	Scheduled Check
ACAD Source Box	SN: 1000	28-May-24 (No. 675-ACAD_Source_Box-240528)	May-25
Signal Generator R&S SMB100A	SN: 182081	28-May-24 (No. 0001-300719404)	May-25
Mismatch; SMA	SN: 1102	22-May-24 (No. 675-Mismatch_SMA-240522)	May-25

	Name	Function	Signature
Calibrated by	Paulo Pina	Laboratory Technician	I.V.
Approved by	Sven Kühn	Technical Manager	

Issued: July 11, 2024

Calibration Laboratory of
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Engineering AG
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Accreditation No.: SCS 0108

Glossary

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

Calibration is Performed According to the Following Standards

- IEC/IEEE 62209-1528,"Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation

- DASY 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%.

Measurement Conditions

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

DASY Version	DASY8 Module SAR	16.4.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with spacer
Zoom Scan Resolution	dx, dy = 6mm, dz = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	1750MHz ±1MHz	

Head TSL parameters at 1750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ±0.2)°C	40.6 ±6%	1.35 mho/m ±6%
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 1750 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	9.34 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	37.2 W/kg ±17.0% (*k* = 2)

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	4.97 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.8 W/kg ±16.5% (*k* = 2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 1750 MHz

Impedance	49.2 Ω – 0.4 jΩ
Return Loss	-41.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.214 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

D1750V2 - SN: 1003

July 11, 2024

System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D1750V2 - SN1003	1750	HSL	24

Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	10		CW, 0--	1750, 0	7.96	1.35	40.6

Hardware Setup

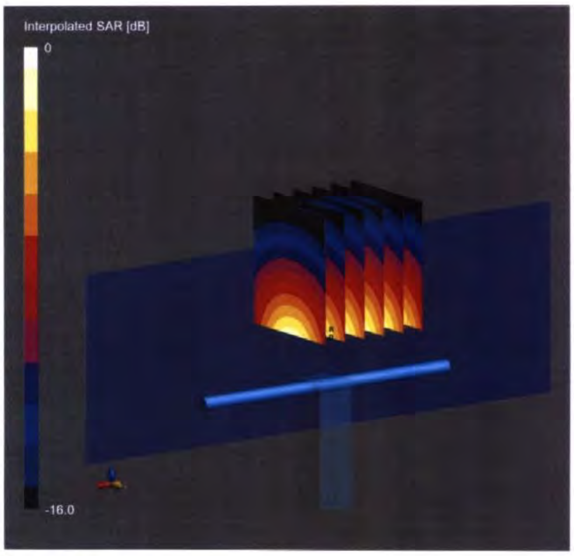
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MFP V8.0 Right	HSL, 2024-07-11	EX3DV4 - SN7349, 2024-06-03	DAE4ip Sn1836, 2024-01-10

Scans Setup

	Zoom Scan
Grid Extents [mm]	30 x 30 x 30
Grid Steps [mm]	6.0 x 6.0 x 1.5
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	All points
Scan Method	Measured

Measurement Results

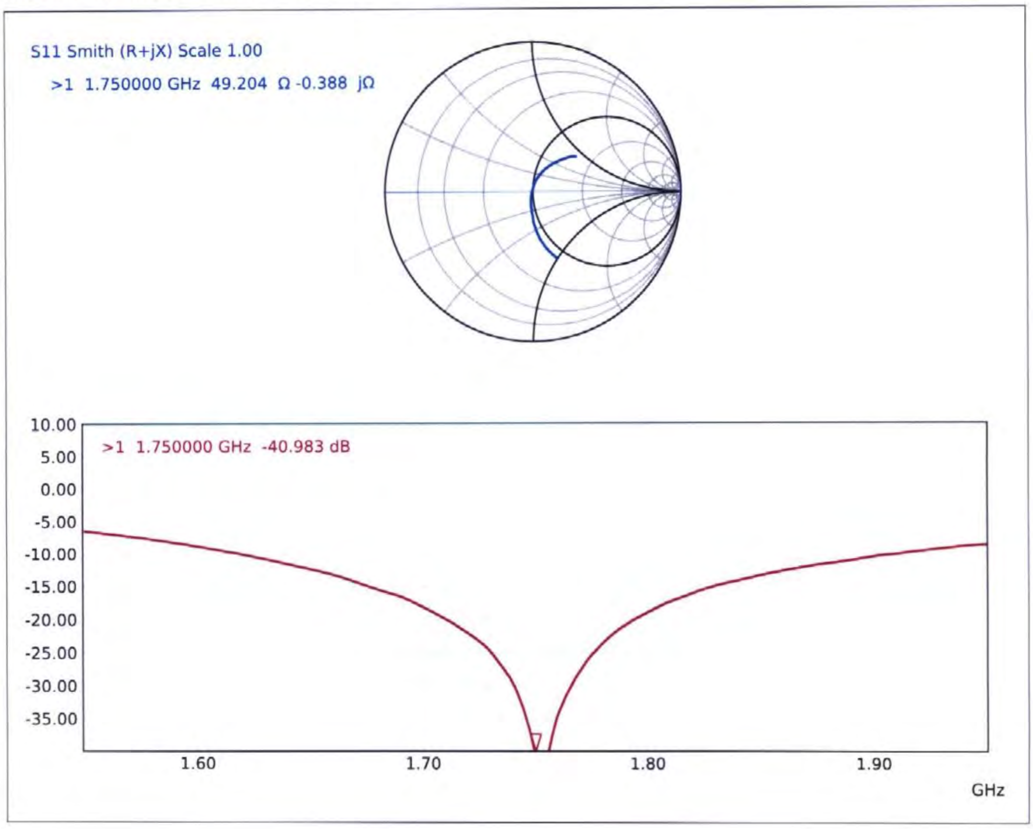
	Zoom Scan
Date	2024-07-11
psSAR1g [W/Kg]	9.34
psSAR10g [W/Kg]	4.97
Power Drift [dB]	0.00
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



0 dB = 16.6 W/Kg

D1750V2 - SN: 1003 July 11, 2024

Impedance Measurement Plot for Head TSL



1900 MHz Dipole Calibration Certificate

Calibration Laboratory of
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Accreditation No.: **SCS 0108**

Client CTTL
Beijing

Certificate No. D1900V2-5d101_Jul24

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d101
Calibration procedure(s)	QA CAL-05.v12 Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz
Calibration date	July 8, 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 (Certificate No.)	Scheduled Cal
Power Sensor R&S NRP-33T	SN: 100967	28-Mar-24 (No. 217-04038)	Mar-25
Power Sensor R&S NRP18A	SN: 101859	21-Mar-24 (No. 4030A315007801)	Mar-25
Spectrum Analyzer R&S FSV40	SN: 101832	25-Jan-24 (No. 4030-315007551)	Jan-25
Mismatch; Short [S4188] Attenuator [S4423]	SN: 1152	28-Mar-24 (No. 217-04050)	Mar-25
OCP DAK-12	SN: 1016	05-Oct-23 (No. OCP-DAK12-1016_Oct23)	Oct-24
OCP DAK-3.5	SN: 1249	05-Oct-23 (No. OCP-DAK3.5-1249_Oct23)	Oct-24
Reference Probe EX3DV4	SN: 7349	03-Jun-24 (No. EX3-7349_Jun24)	Jun-25
DAE4ip	SN: 1836	10-Jan-24 (No. DAE4ip-1836_Jan24)	Jan-25

Secondary Standards	ID	Check Date (in house)	Scheduled Check
ACAD Source Box	SN: 1000	28-May-24 (No. 675-ACAD_Source_Box-240528)	May-25
Signal Generator R&S SMB100A	SN: 182081	28-May-24 (No. 0001-300719404)	May-25
Mismatch; SMA	SN: 1102	22-May-24 (No. 675-Mismatch_SMA-240522)	May-25

	Name	Function	Signature
Calibrated by	Paulo Pina	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: July 8, 2024

Calibration Laboratory of
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Accreditation No.: **SCS 0108**

Glossary

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

Calibration is Performed According to the Following Standards

- IEC/IEEE 62209-1528,"Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation

- DASY 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%.

Measurement Conditions

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

DASY Version	DASY8 Module SAR	16.4.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with spacer
Zoom Scan Resolution	dx, dy = 6mm, dz = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	1900MHz ±1MHz	

Head TSL parameters at 1900 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ±0.2)°C	41.3 ±6%	1.38 mho/m ±6%
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 1900 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	9.83 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.1 W/kg ±17.0% (k = 2)

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	5.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.6 W/kg ±16.5% (k = 2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 1900 MHz

Impedance	49.4 Ω + 4.2 jΩ
Return Loss	-27.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.203 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

System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D1900V2 - SN5d101	1900	HSL	24

Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	10		CW, 0--	1900, 0	7.73	1.38	41.3

Hardware Setup

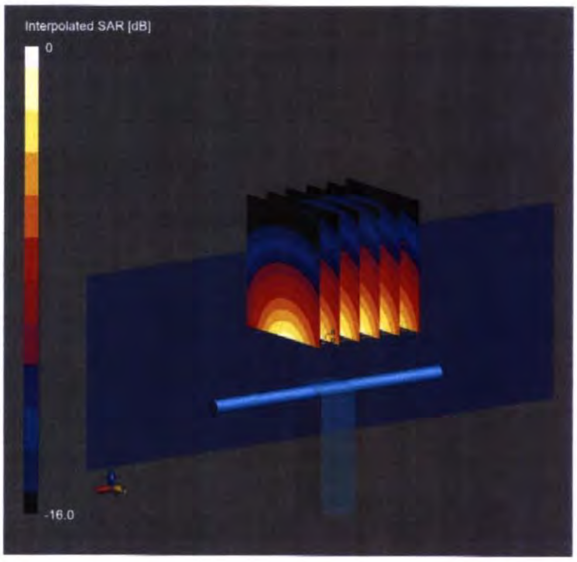
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MFP V8.0 Right	HSL, 2024-07-08	EX3DV4 - SN7349, 2024-06-03	DAE4ip Sn1836, 2024-01-10

Scans Setup

	Zoom Scan
Grid Extents [mm]	30 x 30 x 30
Grid Steps [mm]	6.0 x 6.0 x 1.5
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	All points
Scan Method	Measured

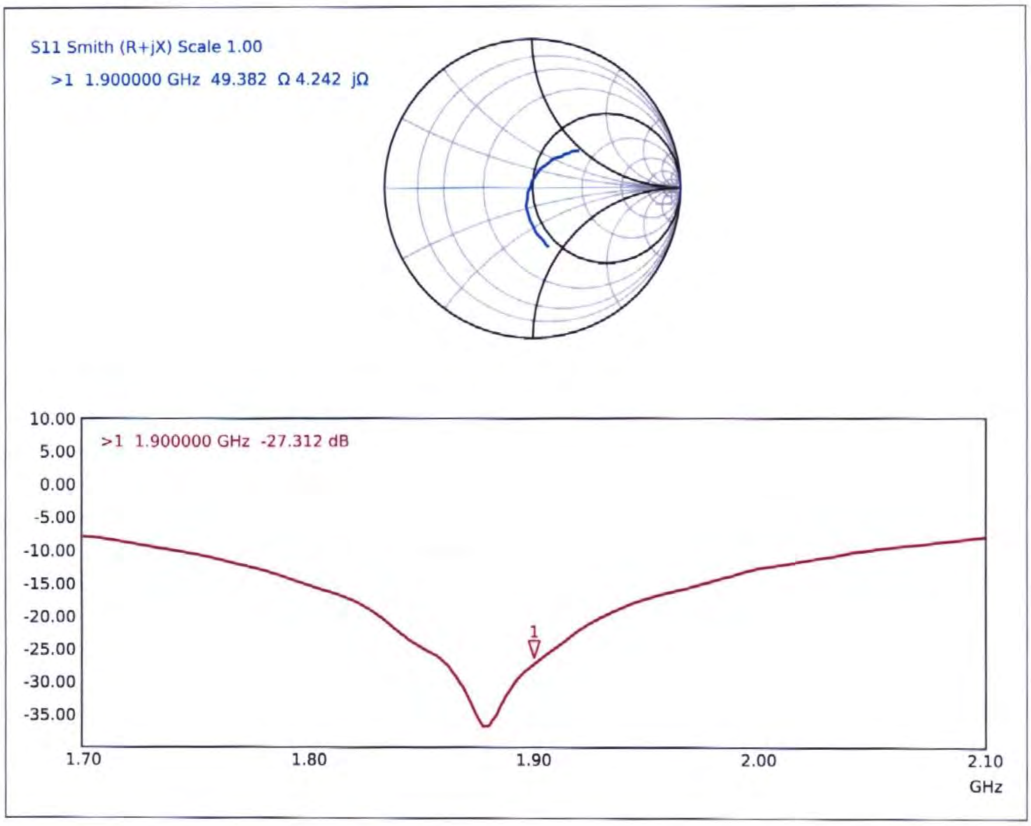
Measurement Results

	Zoom Scan
Date	2024-07-08
psSAR1g [W/Kg]	9.83
psSAR10g [W/Kg]	5.18
Power Drift [dB]	-0.01
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



0 dB = 17.3 W/Kg

Impedance Measurement Plot for Head TSL



2450 MHz Dipole Calibration Certificate

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **CTTL**
Beijing

Certificate No. **D2450V2-853_Jul24**

CALIBRATION CERTIFICATE

Object: D2450V2 - SN: 853

Calibration procedure(s): QA CAL-05.v12
Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz

Calibration date: July 10, 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 (Certificate No.)	Scheduled Cal
Power Sensor R&S NRP-33T	SN: 100967	28-Mar-24 (No. 217-04038)	Mar-25
Power Sensor R&S NRP18A	SN: 101859	21-Mar-24 (No. 4030A315007801)	Mar-25
Spectrum Analyzer R&S FSV40	SN: 101832	25-Jan-24 (No. 4030-315007551)	Jan-25
Mismatch; Short [S4188] Attenuator [S4423]	SN: 1152	28-Mar-24 (No. 217-04050)	Mar-25
OCP DAK-12	SN: 1016	05-Oct-23 (No. OCP-DAK12-1016_Oct23)	Oct-24
OCP DAK-3.5	SN: 1249	05-Oct-23 (No. OCP-DAK3.5-1249_Oct23)	Oct-24
Reference Probe EX3DV4	SN: 7349	03-Jun-24 (No. EX3-7349_Jun24)	Jun-25
DAE4ip	SN: 1836	10-Jan-24 (No. DAE4ip-1836_Jan24)	Jan-25

Secondary Standards	ID	Check Date (in house)	Scheduled Check
ACAD Source Box	SN: 1000	28-May-24 (No. 675-ACAD_Source_Box-240528)	May-25
Signal Generator R&S SMB100A	SN: 182081	28-May-24 (No. 0001-300719404)	May-25
Mismatch; SMA	SN: 1102	22-May-24 (No. 675-Mismatch_SMA-240522)	May-25

	Name	Function	Signature
Calibrated by	Paulo Pina	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: July 10, 2024

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S **Schweizerischer Kalibrierdienst**
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Accreditation No.: SCS 0108

Glossary

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

Calibration is Performed According to the Following Standards

- IEC/IEEE 62209-1528,"Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation

- DASY 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%.

Measurement Conditions

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

DASY Version	DASY8 Module SAR	16.4.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with spacer
Zoom Scan Resolution	dx, dy = 5mm, dz = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	2450MHz ±1MHz	

Head TSL parameters at 2450 MHz

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	38.0 ±6%	1.83 mho/m ±6%
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 2450 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	13.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	52.2 W/kg ±17.0% (*k* = 2)

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	6.16 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.5 W/kg ±16.5% (*k* = 2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 2450 MHz

Impedance	52.4 Ω + 2.6 jΩ
Return Loss	-29.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.163 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

D2450V2 - SN: 853 July 10, 2024

System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D2450V2 - SN853	2450	HSL	24

Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	10		CW, 0--	2450, 0	7.24	1.83	38.0

Hardware Setup

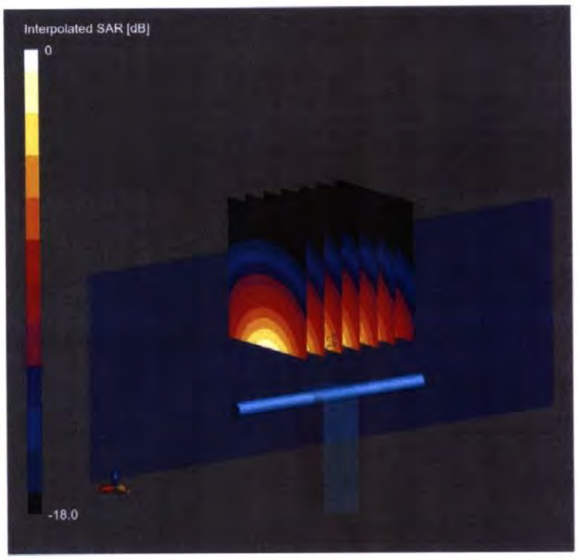
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MFP V8.0 Center	HSL, 2024-07-10	EX3DV4 - SN7349, 2024-06-03	DAE4ip Sn1836, 2024-01-10

Scans Setup

	Zoom Scan
Grid Extents [mm]	30 x 30 x 30
Grid Steps [mm]	5.0 x 5.0 x 1.5
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	VMS + 6p
Scan Method	Measured

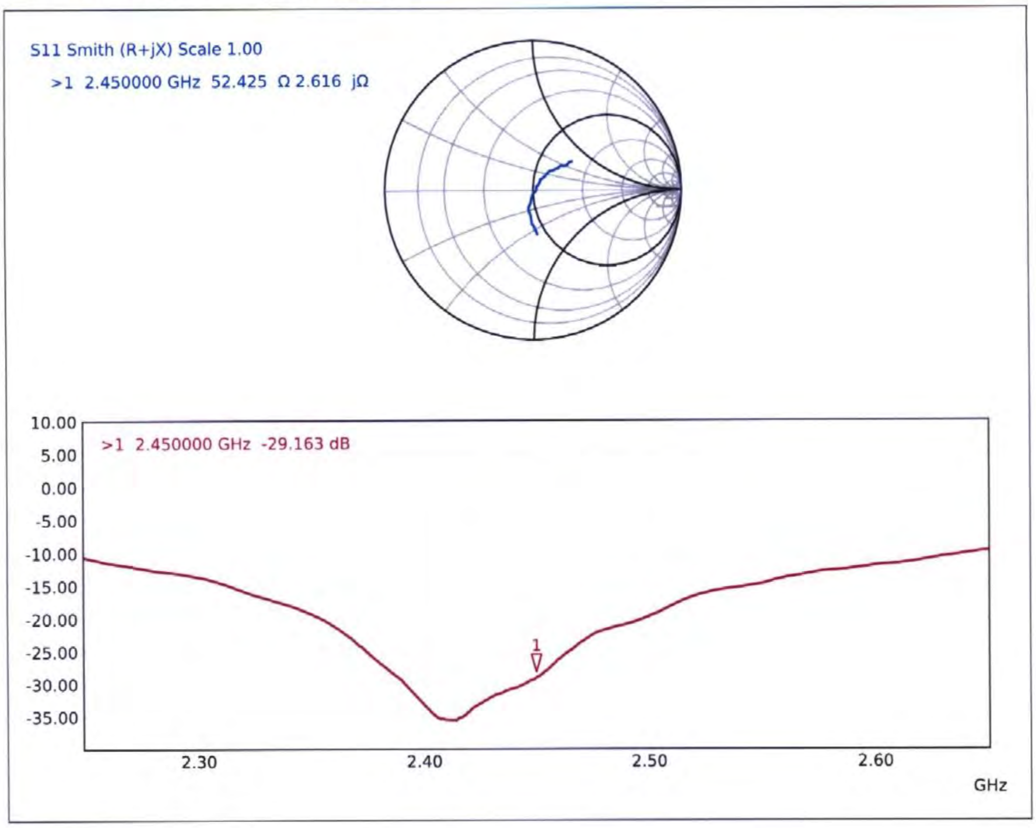
Measurement Results

	Zoom Scan
Date	2024-07-10
psSAR1g [W/Kg]	13.1
psSAR10g [W/Kg]	6.16
Power Drift [dB]	0.00
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



0 dB = 26.6 W/Kg

Impedance Measurement Plot for Head TSL



ANNEX I Accreditation Certificate

Accredited Laboratory

A2LA has accredited

TELECOMMUNICATION TECHNOLOGY LABS, CAICT

Beijing, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 23rd day of July 2024.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 7049.01
Valid to July 31, 2026

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.