RF Exposure Lab

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CERTIFICATE OF COMPLIANCE
SAR EVALUATION

Haivision	Dates of Test: August 31 – September 16, 2023
2600 Blvd. Alfed-Nobel, 5th Floor	Test Report Number: SAR.20230608
Montreal, QC H4S0A9	Revision B
Canada	Lab Designation Number: US1195 (FCC); US0194 (ISED)

FCC ID:	2ASIK-EM91 & 2ASIK-CB178NF
IC Certificate:	21415-EM91 & 21415-CB178NF
HVIN/Model(s):	Pro460
Contains Cellular Module:	Aviwest Model EM9191
Contains WiFi Module:	Aviwest Model AW-CB178NF
Test Sample:	Engineering Unit Same as Production
Serial Number:	AVWPRO40523008993
Equipment Type:	Wireless Video Transceiver
Classification:	Portable Transmitter Next to Body
TX Frequency Range:	663 – 698 MHz, 699 – 716 MHz, 824 – 849 MHz, 1710 – 1780 MHz, 1850 – 1915 MHz, 2500 – 2570 MHz, 2570 – 2620 MHz, 3550 – 3700 MHz, 3300 – 4200 MHz
Frequency Tolerance:	± 2.5 ppm
Maximum RF Output:	600 MHz (FR1) – 24.5 dBm, 750 MHz (FR1) – 24.5 dBm, 850 MHz (FR1) – 24.5 dBm, 1750 MHz (FR1) – 24.5 dBm, 1900 MHz (FR1) – 24.5 dBm, 2550 MHz (FR1) – 24.5 dBm, 3600 MHz (FR1) – 24.5 dBm, 3700 MHz (FR1) – 24.5 dBm Conducted
Signal Modulation:	DFT-s-OFDM/CP-OFDM, Pi2 BPSK
Antenna Type:	Internal
Application Type:	Certification
FCC Rule Parts:	Part 2, 22, 24, 27, 90
KDB Test Methodology:	KDB 447498 D01 v06, KDB 941225 D05 v02r05
Industry Canada:	RSS-102 Issue 6, Safety Code 6
Max. Stand Alone SAR Value:	0.90 W/kg Reported
Max. Simultaneous Value:	1.50 W/kg Reported
Separation Distance:	15 mm

This wireless mobile and/or portable device has been shown to be compliant for localized specific absorption rate (SAR) for uncontrolled environment/general exposure limits specified in ANSI/IEEE Std. C95.1-1992 and had been tested in accordance with the measurement procedures specified in IEEE 1528-2013 and IEC 62209-1528:2020 (See test report).

I attest to the accuracy of the data. All measurements were performed by myself or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

RF Exposure Lab, LLC certifies that no party to this application is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).

Jay M. Moulton
Vice President

ACCREDITED
Testing Cert. # 2387.01

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Table of Contents

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Comment/Revision	Date
Original Release	October 9, 2023
Revision A – Correct the report number on page 1	February 2, 2024
Revision B – Replace Sierra Wireless & Azureware with Aviwest on page 1, evaluated report to RSS-102 Issue 6, add 'The 15 mm gap is the thickness of the backpack' on page 20, add exclusion of BT testing on page 20 and correct type of Extremity to Body on page 38	June 13, 2024

Note: The latest version supersedes all previous versions listed in the above table. The latest version shall be used.

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1. Introduction

This measurement report shows compliance of the Haivision Model Pro460 FCC ID: 2ASIK-EM91 & 2ASIK-CB178NF with FCC Part 2, 1093, ET Docket 93-62 Rules for mobile and portable devices and IC Certificate: 21415-EM91 & 21415-CB178NF with RSS102 Issue 6 & Safety Code 6. The FCC/ISED have adopted the guidelines for evaluating the environmental effects of radio frequency radiation to protect the public and workers from the potential hazards of RF emissions due to FCC/ISED regulated portable devices. [1], [6]

The test results recorded herein are based on a single type test of Haivision Model Pro460 and therefore apply only to the tested sample.

The testing is this report was conducted on two transmit antennas. One in each plane of the device. The two remaining antennas on the same plane with the same distance were spot checked to verify the values were similar. Antenna M2 and M6 were chosen to do a full evaluation. Antennas M1, M3, M4 and M5 were spot checked. Both of the WiFi antennas had a full evaluation conducted on each antenna.

The test procedures and limits, as described in ANSI C95.1 – 1999 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [2], ANSI C95.3 – 2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields [3], IEEE Std.1528 – 2013 Recommended Practice [4], and Industry Canada Safety Code 6 Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3kHz to 300 GHz were employed.

The following table indicates all the wireless technologies operating in the Pro460 Wireless Video Transceiver. The table also shows the tolerance for the power level for each mode.

Band	Technology	3GPP Nominal Power dBm	Calibrated Nominal Power dBm	Tolerance dBm	Lower Tolerance dBm	Upper Tolerance dBm
Band n2	FR1	23.7	23.7	+0.8/-2.2	21.5	24.5
Band n5	FR1	23.7	23.7	+0.8/-2.2	21.5	24.5
Band n7	FR1	23.0	23.0	+1.5/-1.5	21.5	24.5
Band n12	FR1	23.0	23.0	+1.5/-1.5	21.5	24.5
Band n25	FR1	23.0	23.0	+1.5/-1.5	21.5	24.5
Band n38	FR1	23.0	23.0	+1.5/-1.5	21.5	24.5
Band n48	FR1	23.7	23.7	+0.8/-2.2	21.5	24.5
Band n66	FR1	23.7	23.7	+0.8/-2.2	21.5	24.5
Band n71	FR1	23.0	23.0	+1.5/-1.5	21.5	24.5
Band n77	FR1	23.7	23.7	+0.8/-2.2	21.5	24.5
Band n78	FR1	23.0	23.0	+1.5/-1.5	21.5	24.5

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LTE UL CA Combinations (Aggregate Power)

Band UL 2CA Combination	Technology	Class	Nominal dBm	Tolerance dBm	Lower Tolerance dBm	Upper Tolerance dBm
12A-4A	LTE	23.0	23.0	+1.0/-1.0	22.0	24.0
12A-2A	LTE	23.0	23.0	+1.0/-1.0	22.0	24.0
13A-2A	LTE	23.0	23.0	+1.0/-1.0	22.0	24.0
13A-4A	LTE	23.0	23.0	+1.0/-1.0	22.0	24.0
5A-2A	LTE	23.0	23.0	+1.0/-1.0	22.0	24.0
5A-4A	LTE	23.0	23.0	+1.0/-1.0	22.0	24.0
66A-2A	LTE	23.0	23.0	+1.0/-1.0	22.0	24.0
66A-5A	LTE	23.0	23.0	+1.0/-1.0	22.0	24.0
7A-5A	LTE	23.0	23.0	+1.0/-1.0	22.0	24.0

FR1 NSA UL ENDC Combinations (Aggregate Power)

Band UL ENDC Combination	Technology	Class	Nominal dBm	Tolerance dBm	Lower Tolerance dBm	Upper Tolerance dBm
12A-n66A	LTE+FR1	3	23.0	+1.5/-1.5	21.5	24.5
12A-n2A	LTE+FR1	3	23.0	+1.5/-1.5	21.5	24.5
13A-n66A	LTE+FR1	3	23.0	+1.5/-1.5	21.5	24.5
13A-n2A	LTE+FR1	3	23.0	+1.5/-1.5	21.5	24.5
2A-n5A	LTE+FR1	3	23.0	+1.5/-1.5	21.5	24.5
2A-n71A	LTE+FR1	3	23.0	+1.5/-1.5	21.5	24.5
41A-n77A	LTE+FR1	3	23.0	+1.5/-1.5	21.5	24.5
5A-n66A	LTE+FR1	3	23.0	+1.5/-1.5	21.5	24.5
5A-n2A	LTE+FR1	3	23.0	+1.5/-1.5	21.5	24.5
66A-n5A	LTE+FR1	3	23.0	+1.5/-1.5	21.5	24.5
66A-n71A	LTE+FR1	3	23.0	+1.5/-1.5	21.5	24.5
7A-n5A	LTE+FR1	3	23.0	+1.5/-1.5	21.5	24.5
7A-n71A	LTE+FR1	3	23.0	+1.5/-1.5	21.5	24.5

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SAR Definition [5]

Specific Absorption Rate is defined as 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).

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

SAR is expressed in units of watts per kilogram (W/kg). *SAR* can be related to the electric field at a point by

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

where:

σ = conductivity of the tissue (S/m)

ρ = mass density of the tissue (kg/m^3)

E = rms electric field strength (V/m)

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2. SAR Measurement Setup

Robotic System

These measurements are performed using the DASY52 automated dosimetric assessment system. The DASY52 is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Staubli), robot controller, Intel Core2 computer, near-field probe, probe alignment sensor, and the generic twin phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF) (see Fig. 2.1).

System Hardware

A cell controller system contains the power supply, robot controller teach pendant (Joystick), and a remote control used to drive the robot motors. The PC consists of the HP Intel Core2 computer with Windows XP system and SAR Measurement Software DASY52, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit that performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.

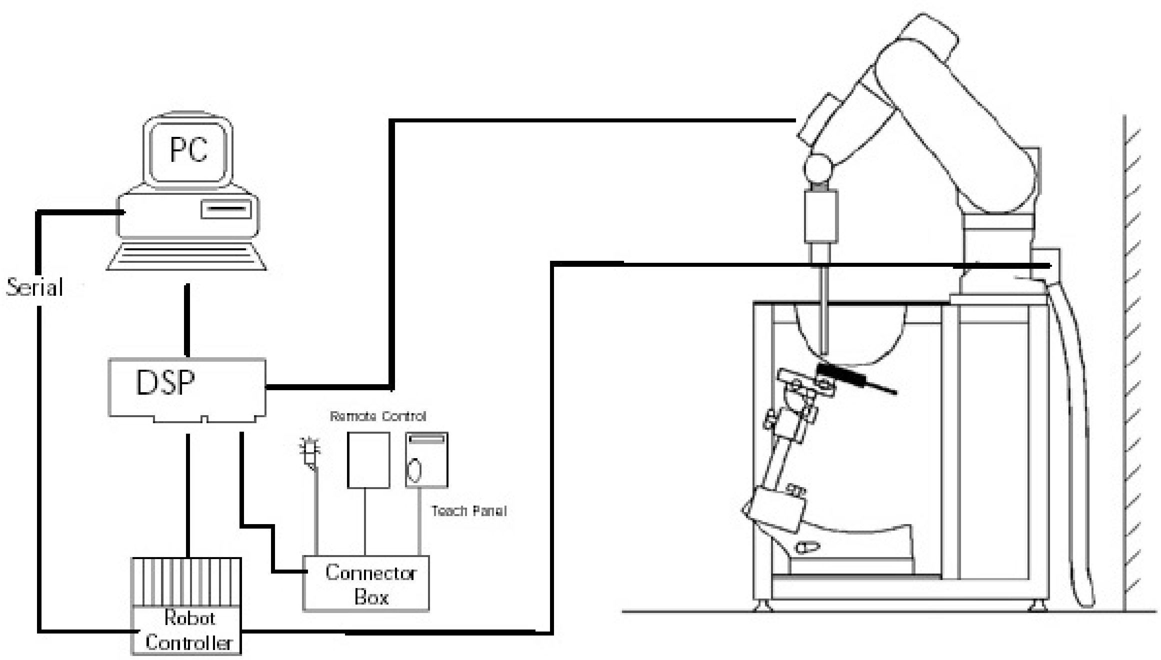

Figure 2.1 SAR Measurement System Setup

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System Electronics

The DAE4 consists 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 and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail in.

Probe Measurement System

The SAR measurements were conducted with the dosimetric probe EX3DV4, designed in the classical triangular configuration (see Fig. 2.2) 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 multi fiber line ending at the front of the probe tip. (see Fig. 2.3) 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 DASY52 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped at reaching the maximum.

DAE System

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Probe Specifications

Calibration: In air from 10 MHz to 6.0 GHz
In brain and muscle simulating tissue at Frequencies of 450 MHz, 835 MHz, 1750 MHz, 1900 MHz, 2450 MHz, 2600 MHz, 3500 MHz, 5200 MHz, 5300 MHz, 5600 MHz, 5800 MHz

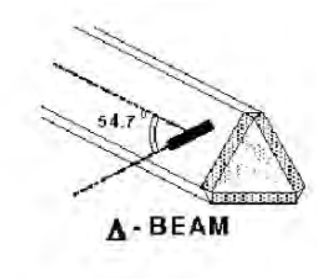

Figure 2.2 Triangular Probe Configurations

Frequency: 10 MHz to 6 GHz

Linearity: ±0.2dB (30 MHz to 6 GHz)

Dynamic: 10 mW/kg to 100 W/kg

Range: Linearity: ±0.2dB

Dimensions: Overall length: 330 mm

Tip length: 20 mm

Body diameter: 12 mm

Tip diameter: 2.5 mm

Distance from probe tip to sensor center: 1 mm


Figure 2.3 Probe Thick-Film Technique

Application: SAR Dosimetry Testing
Compliance tests of wireless device

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Probe Calibration Process

Dosimetric Assessment Procedure

Each probe is calibrated according to a dosimetric assessment procedure described in with accuracy better than +/-10%. The spherical isotropy was evaluated with the procedure described in and found to be better than +/-0.25dB. The sensitivity parameters (Norm X, Norm Y, Norm Z), the diode compression parameter (DCP) and the conversion factor (Conv F) of the probe is tested.

Free Space Assessment

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1 GHz, and in a waveguide above 1GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity 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.

Temperature Assessment *

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

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

where:

Δt = exposure time (30 seconds),

C = heat capacity of tissue (brain or muscle),

ΔT = temperature increase due to RF exposure.

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

where:

σ = simulated tissue conductivity,

ρ = Tissue density (1.25 g/cm^3 for brain tissue)

SAR is proportional to ΔT / Δt , the initial rate of tissue heating, before thermal diffusion takes place.
Now it's possible to quantify the electric field in the simulated tissue by equating the thermally derived SAR to the E- field;

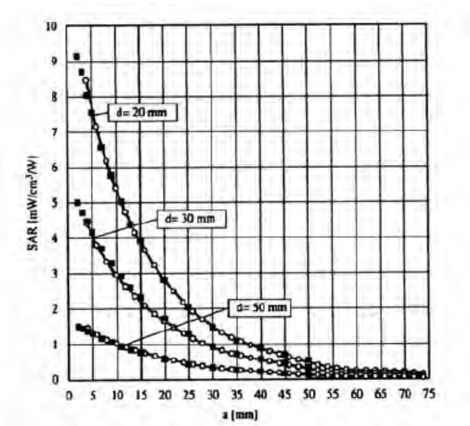

Figure 2.4 E-Field and Temperature Measurements at 900MHz

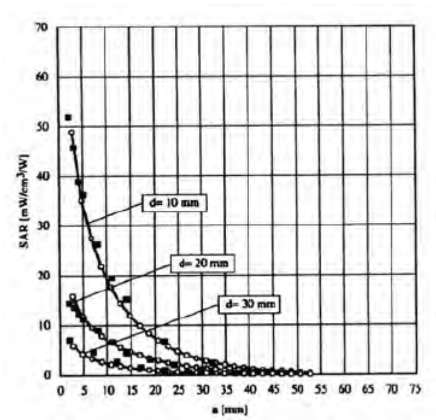

Figure 2.5 E-Field and Temperature Measurements at 1800MHz

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Data Extrapolation

The DASY52 software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given like below;

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

with V_i = compensated signal of channel i (i=x,y,z)
U_i = input signal of channel i (i=x,y,z)
cf = crest factor of exciting field (DASY parameter)
dcp_i = diode compression point (DASY parameter)

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

E-field probes:

$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

with V_i = compensated signal of channel i (i = x,y,z)
$Norm_i$ = sensor sensitivity of channel i (i = x,y,z) $\mu V/(V/m)^2$ for E-field probes
ConvF = sensitivity of enhancement in solution
E_i = electric field strength of channel i in V/m

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

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

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

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

$$P_{pwe} = \frac{E_{tot}^2}{3770}$$

with P_{pwe} = equivalent power density of a plane wave in W/cm^2
E_{tot} = total electric field strength in V/m

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Scanning procedure

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

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

- The highest integrated SAR value is the main concern in compliance test applications. These values can mostly be found at the inner surface of the phantom and cannot be measured directly due to the sensor offset in the probe. To extrapolate the surface values, the measurement distances to the surface must be known accurately. A distance error of 0.5mm could produce SAR errors of 6% at 1800 MHz. Using predefined locations for measurements is not accurate enough. Any shift of the phantom (e.g., slight deformations after filling it with liquid) would produce high uncertainties. For an automatic and accurate detection of the phantom surface, the DASY5 system uses the mechanical surface detection. The detection is always at touch, but the probe will move backward from the surface the indicated distance before starting the measurement.

- The „area scan“ measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strength is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The scan uses different grid spacings for different frequency measurements. Standard grid spacing for head measurements in frequency ranges ≤ 2GHz is 15 mm in x - and y- dimension. For higher frequencies a finer resolution is needed, thus for the grid spacing is reduced according the following table:

Area scan grid spacing for different frequency ranges	
Frequency range	Grid spacing
≤ 2 GHz	≤ 15 mm
2 – 4 GHz	≤ 12 mm
4 – 6 GHz	≤ 10 mm

Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation. Results of this coarse scan are shown in annex B.

- A „zoom scan” measures the field in a volume around the 2D peak SAR value acquired in the previous „coarse“ scan. It uses a fine meshed grid where the robot moves the probe in steps along all the 3 axis (x,y and z-axis) starting at the bottom of the Phantom. The grid spacing for the cube measurement is varied according to the measured frequency range, the dimensions are given in the following table:

Zoom scan grid spacing and volume for different frequency ranges			
Frequency range	Grid spacing for x, y axis	Grid spacing for z axis	Minimum zoom scan volume
≤ 2 GHz	≤ 8 mm	≤ 5 mm	≥ 30 mm
2 – 3 GHz	≤ 5 mm	≤ 5 mm	≥ 28 mm
3 – 4 GHz	≤ 5 mm	≤ 4 mm	≥ 28 mm
4 – 5 GHz	≤ 4 mm	≤ 3 mm	≥ 25 mm
5 – 6 GHz	≤ 4 mm	≤ 2 mm	≥ 22 mm

DASY is also able to perform repeated zoom scans if more than 1 peak is found during area scan. In this document, the evaluated peak 1g and 10g averaged SAR values are shown in the 2D-graphics in annex B. Test results relevant for the specified standard (see section 3) are shown in table form in section 7.

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Spatial Peak SAR Evaluation

The spatial peak SAR - value for 1 and 10 g is evaluated after the Cube measurements have been done. The basis of the evaluation are the SAR values measured at the points of the fine cube grid consisting of all points in the three directions x, y and z. The algorithm that finds the maximal averaged volume is separated into three different stages.

- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 1 to 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting 'Graph Evaluated'.

- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.

- All neighbouring volumes are evaluated until no neighbouring volume with a higher average value is found.

Extrapolation

The extrapolation is based on a least square algorithm [W. Gander, Computermathematik, p.168-180]. Through the points in the first 3 cm along the z-axis, polynomials of order four are calculated. These polynomials are then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1 mm from each other.

Interpolation

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a knot"-condition [W. Gander, Computermathematik, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff].

Volume Averaging

At First the size of the cube is calculated. Then the volume is integrated with the trapezoidal algorithm. 8000 points (20x20x20) are interpolated to calculate the average.

Advanced Extrapolation

DASY uses the advanced extrapolation option which is able to compensate boundary effects on E-field probes.

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SAM PHANTOM

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. 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. (see Fig. 2.6)

Phantom Specification

Phantom: SAM Twin Phantom (V4.0)
Shell Material: Vivac Composite
Thickness: 2.0 ± 0.2 mm

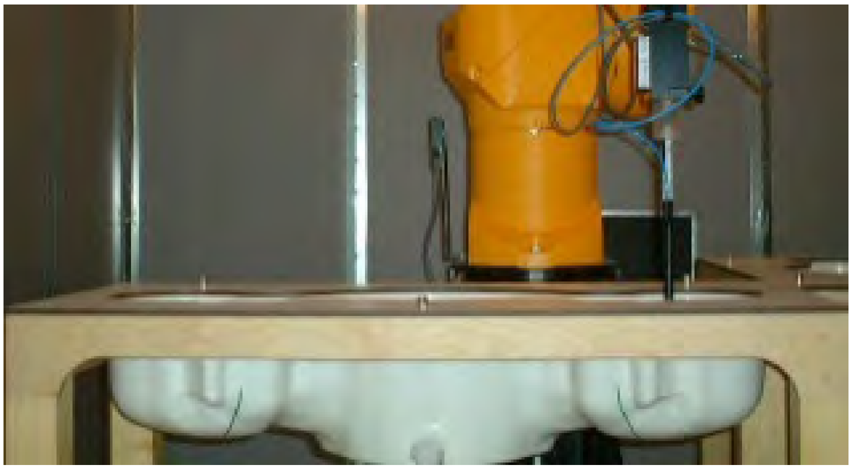

Figure 2.6 SAM Twin Phantom

Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0 the Mounting Device (see Fig. 2.7), enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation point is the ear opening. The devices can be easily, accurately, and repeat ably be positioned according to the FCC, CENELEC, IEC and IEEE specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

Figure 2.7 Mounting Device

Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produce infinite number of configurations. To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

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3. Probe and Dipole Calibration

See Appendix D and E.

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4. Phantom & Simulating Tissue Specifications

Head & Body Simulating Mixture Characterization

The head mixture consist of the material based on the table listed below. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue.

Table 4.1 Typical Composition of Ingredients for Tissue

Ingredients		Simulating Tissue					
		750 MHz Head	900 MHz Head	1750 MHz Head	1900 MHz Head	2550 MHz Head	3700 MHz Head
Mixing Percentage							
Water		Proprietary Purchased From Speag					
Sugar							
Salt							
HEC							
Bactericide							
DGBE							
Dielectric Constant	Target	41.94	41.50	40.08	40.00	39.07	37.70
Conductivity (S/m)	Target	0.89	0.97	1.37	1.40	1.91	3.12

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5. ANSI/IEEE C95.1 – 1992 RF Exposure Limits [2]

Uncontrolled Environment

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

Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Table 5.1 Human Exposure Limits

	UNCONTROLLED ENVIRONMENT General Population (W/kg) or (mW/g)	CONTROLLED ENVIROMENT Professional Population (W/kg) or (mW/g)
SPATIAL PEAK SAR [1] Head	1.60	8.00
SPATIAL AVERAGE SAR [2] Whole Body	0.08	0.40
SPATIAL PEAK SAR [3] Hands, Feet, Ankles, Wrists	4.00	20.00

[1] The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
[2] The Spatial Average value of the SAR averaged over the whole body.
[3] The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

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6. Measurement Uncertainty

Measurement uncertainty table is not required per KDB 865664 D01 v01 section 2.8.2 page 12. SAR measurement uncertainty analysis is required in the SAR report only when the highest measured SAR in a frequency band is ≥ 1.5 W/kg for 1-g SAR. The equivalent ratio (1.5/1.6) should be applied to extremity and occupational exposure conditions. The highest reported value is less than 1.5 W/kg. Therefore, the measurement uncertainty table is not required.

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7. System Validation

Tissue Verification

Table 7.1 Measured Tissue Parameters

		750 MHz Head		900 MHz Head		1750 MHz Head	
Date(s)		Sep. 11, 2023		Sep. 11, 2023		Sep. 12, 2023	
Liquid Temperature (˚C)	20.0	Target	Measured	Target	Measured	Target	Measured
Dielectric Constant: ε		41.94	40.89	41.50	40.86	40.08	39.39
Conductivity: σ		0.89	0.92	0.97	1.00	1.37	1.39
		1900 MHz Head		2550 MHz Head		3700 MHz Head	
Date(s)		Sep. 13, 2023		Sep. 13, 2023		Sep. 14, 2023	
Liquid Temperature (˚C)	20.0	Target	Measured	Target	Measured	Target	Measured
Dielectric Constant: ε		40.00	39.65	39.07	38.69	37.70	37.02
Conductivity: σ		1.40	1.42	1.91	1.93	3.12	3.13

See Appendix A for data printout.

Test System Verification

Prior to assessment, the system is verified to the ±10% of the specifications at the test frequency by using the system kit. Power is normalized to 1 watt. (Graphic Plots Attached)

Table 7.2 System Dipole Validation Target & Measured

	Test Frequency	Targeted SAR_{1g} (W/kg)	Measure SAR_{1g} (W/kg)	Tissue Used for Verification	Deviation (%)	Plot Number
11-Sep-2023	750 MHz	8.57	8.56	Head	- 0.12	1
11-Sep-2023	900 MHz	11.20	11.70	Head	+ 4.46	2
12-Sep-2023	1750 MHz	37.70	37.70	Head	+ 0.00	3
13-Sep-2023	1900 MHz	40.40	41.70	Head	+ 3.22	4
13-Sep-2023	2550 MHz	55.30	56.60	Head	+ 2.35	5
14-Sep-2023	3700 MHz	68.30	69.50	Head	+ 1.76	6

See Appendix A for data plots.

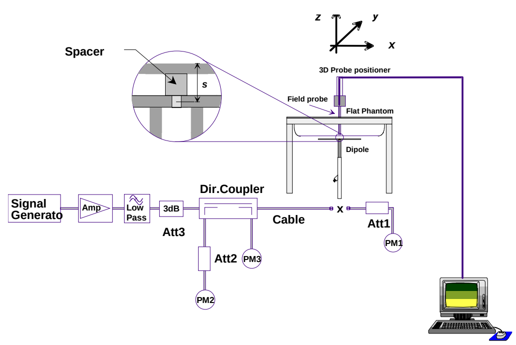

Figure 7.1 Dipole Validation Test Setup

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8. SAR Test Data Summary

See Measurement Result Data Pages

See Appendix B for SAR Test Data Plots.
See Appendix C for SAR Test Setup Photos.

Procedures Used To Establish Test Signal

The device was either placed into simulated transmit mode using the manufacturer's test codes or the actual transmission is activated through a base station simulator or similar equipment. See data pages for actual procedure used in measurement.

Device Test Condition

In order to verify that the device was tested at full power, conducted output power measurements were performed before and after each SAR measurement to confirm the output power unless otherwise noted. If a conducted power deviation of more than 5% occurred, the test was repeated. The power drift of each test is measured at the start of the test and again at the end of the test. The drift percentage is calculated by the formula ((end/start)-1)*100 and rounded to three decimal places. The drift percentage is calculated into the resultant SAR value on the data sheet for each test.

Required Test Positions						
Antenna	Top	Back	Front	Left	Right	Bottom
Ant M1	No	Yes	No	No	No	No
Ant M3	No	Yes	No	No	No	No
Ant M2	No	Yes	No	No	No	No
Ant M4	No	Yes	No	No	No	No
Ant M5	No	Yes	No	No	No	No
Ant M6	No	Yes	No	No	No	No
WiFi W1	No	Yes	No	No	No	No
WiFi W2	No	Yes	No	No	No	No

All testing was conducted with a 15 mm gap. The 15 mm gap was used to simulate the case the device is carried in when in use by the user. The 15 mm gap is the thickness of the backpack.

The Bluetooth testing was excluded from SAR testing due to the low power of the transmitter. The maximum power of the Bluetooth transmitter is 4 dBm (2.5 mW).

For the FCC, the exclusion was based on the calculation in KDB447498 v06 section 4.3.1 a). The following is the formula for the Bluetooth transmitter.

$[(2.5 \text{ mW})/(5 \text{ mm})]*\sqrt{2.48}=0.79$ which is equal to or less than 3.0

For ISED, the exclusion is based on RSS-102 Issue 6 section 6.3 table 11. Therefore, for a separation distance of 5 mm in the table, the exclusion limit is 3 mW. The Bluetooth transmitter have a maximum transmit power of 2.5 mW which is below the 3 mW threshold. Therefore, the Bluetooth transmitter is excluded from SAR testing.

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FR1 Conducted Power

GENERAL NOTE:

1. NR implementation of n2, n5, n66, n71 and n77 is limited to EN-DC operations only (NSA), with LTE Bands 2/5/7/12/13/25/66/41 acting as anchor bands, SAR tests for NR Bands and LTE Anchors Bands were performed separately due to limitations in SAR probe calibration factors. the detail EN-DC combination are included.
2. 5G NR support SCS 15KHz / 30KHz, DFT-s/CP-OFDM, PI/2 BPSK/QPSK/16QAM/64QAM/256QAM and supported Bandwidths
3. For 5G NR test procedure was following step similar FCC KDB 941225 D05:
   a. For DFT-s-OFDM and CP-OFDM output power measurement reduction, according to 38.101 maximum power reduction for power class 2 and 3, the CP-OFDM mode will not higher than DFT-s-OFDM mode, therefore, similar FCC KDB 941225 D05 procedure for other modulation output power for each RB allocation configuration is > not ½ dB higher than the same configuration in DFT-s-Pi/2 BPSK and the reported SAR for the DFT-s-Pi/2 BPSK configuration is ≤ 1.45 W/kg; CP-OFDM measurement is unnecessary.
   b. For DFT-s-OFDM output power measurement reduction, according to 38.101 maximum power reduction for power class 3, full measurement on Pi/2 BPSK/QPSK/16QAM/64QMA/256QAM with larger bandwidth, for smaller bandwidth output power also spot check 1RB 1offset configuration at Pi/2 BPSK to ensure output power will not ½ dB higher than largest supported bandwidth.
   c. SAR testing start with the largest channel bandwidth and measure SAR for PI/2 BPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
   d. 50% RB allocation for PI/2 BPSK SAR testing follows 1RB PI/2 BPSK allocation procedure
   e. PI/2 BPSK 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 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.
   f. QPSK/16QAM/64QAM/256QAM output powers are not ½ dB higher than the same configuration in PI/2 BPSK, also reported SAR for the PI/2 BPSK configuration is less than 1.45 W/kg, QPSK/16QAM/64QAM/256QAM SAR testing are not required.
   g. Smaller bandwidth output power for each RB allocation configuration for this device will not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg, smaller bandwidth SAR testing is not required for this device.
4. FR1 band 2/38/78 SAR test was covered by Band 25/77; according to April 2015 TCB workshop, SAR test for overlapping FR1 bands can be reduced if
   a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
   b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band
5. Due to test setup limitations, SAR testing for NR was performed using Factory Test Mode software to establish the connection and perform SAR with 100% duty cycle. The Qualcomm QRCT program was used to establish the connection.
6. All conducted measurements were conducted on antenna M1 and M3. For antennas M2, M4, M5 and M6, only the channel and configuration tested had the conduct power measured. See the data sheets below.

3GPP 38.101 MPR FOR EN-DC

Table 6.2.2-1 Maximum power reduction (MPR) for power class 3

Modulation		MPR (dB)		
		Edge RB allocations	Outer RB allocations	Inner RB allocations
DFT-s-OFDM	Pi/2 BPSK	≤ 3.5[1]	≤ 1.2[1]	≤ 0.2[1]
		≤ 0.5[2]	≤ 0.5[2]	0[2]
	QPSK	≤ 1		0
	16 QAM	≤ 2		≤ 1
	64 QAM	≤ 2.5		
	256 QAM	≤ 4.5		
CP-OFDM	QPSK	≤ 3		≤ 1.5
	16 QAM	≤ 3		≤ 2
	64 QAM	≤ 3.5		
	256 QAM	≤ 6.5		

NOTE 1: Applicable for UE operating in TDD mode with Pi/2 BPSK modulation and UE indicates support for UE capability *powerBoosting-pi2BPSK* and if the IE *powerBoostPi2BPSK* is set to 1 and 40 % or less slots in radio frame are used for UL transmission for bands n40, n41, n77, n78 and n79. The reference power of 0 dB MPR is 26 dBm.
NOTE 2: Applicable for UE operating in FDD mode, or in TDD mode in bands other than n40, n41, n77, n78 and n79 with Pi/2 BPSK modulation and if the IE *powerBoostPi2BPSK* is set to 0 and if more than 40 % of slots in radio frame are used for UL transmission for bands n40, n41, n77, n78 and n79.

Table 6.2.2-2 Maximum power reduction (MPR) for power class 2

Modulation		MPR (dB)		
		Edge RB allocations	Outer RB allocations	Inner RB allocations
DFT-s-OFDM	Pi/2 BPSK	≤ 3.5	≤ 0.5	0
	QPSK	≤ 3.5	≤ 1	0
	16 QAM	≤ 3.5	≤ 2	≤ 1
	64 QAM	≤ 3.5	≤ 2.5	
	256 QAM	≤ 4.5		
CP-OFDM	QPSK	≤ 3.5	≤ 3	≤ 1.5
	16 QAM	≤ 3.5	≤ 3	≤ 2
	64 QAM	≤ 3.5		
	256 QAM	≤ 6.5		

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Table 9.1 FR1 Full Power Measurements

<n2 Ant>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				372000	376000	380000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1860	1880	1900		
20	PI/2 BPSK	1	1	23.04	23.23	23.41	24.5	0.0
20	PI/2 BPSK	1	53	23.42	23.43	23.14		
20	PI/2 BPSK	1	104	23.22	23.41	23.23		
20	PI/2 BPSK	50	0	22.39	22.31	22.41	23.5	1.0
20	PI/2 BPSK	50	28	22.35	22.22	22.41		
20	PI/2 BPSK	50	56	22.39	22.10	22.07		
20	PI/2 BPSK	100	0	22.03	22.32	22.11	23.5	1.0
20	QPSK	1	1	23.34	23.11	23.47	24.5	0.0
20	QPSK	1	53	23.08	23.40	23.44		
20	QPSK	1	104	23.37	23.31	23.26		
20	QPSK	50	0	22.32	22.16	22.11	23.5	1.0
20	QPSK	50	28	22.09	22.27	22.39		
20	QPSK	50	56	22.28	22.32	22.06		
20	QPSK	100	0	22.01	22.48	22.05	23.5	1.0
20	16QAM	1	1	23.38	23.10	23.07	24.5	0.0
20	16QAM	1	53	23.01	23.11	23.07		
20	16QAM	1	104	23.31	23.12	23.08		
20	16QAM	50	0	22.44	22.33	22.33	23.5	1.0
20	16QAM	50	28	22.45	22.28	22.22		
20	16QAM	50	56	22.28	22.26	22.35		
20	16QAM	100	0	22.36	22.36	22.34	23.5	1.0
20	64QAM	1	1	23.27	23.07	23.27	24.5	0.0
20	64QAM	1	53	23.21	23.35	23.30		
20	64QAM	1	104	23.29	23.33	23.22		
20	64QAM	50	0	22.31	22.44	22.10	23.5	1.0
20	64QAM	50	28	22.01	22.32	22.49		
20	64QAM	50	56	22.23	22.22	22.45		
20	64QAM	100	0	22.29	22.40	22.05	23.5	1.0
20	256QAM	1	1	23.13	23.09	23.44	24.5	0.0
20	256QAM	1	53	23.47	23.43	23.38		
20	256QAM	1	104	23.24	23.05	23.32		
20	256QAM	50	0	22.26	22.15	22.47	23.5	1.0
20	256QAM	50	28	22.30	22.48	22.48		
20	256QAM	50	56	22.30	22.06	22.04		
20	256QAM	100	0	22.14	22.20	22.10	23.5	1.0
Channel				371500	376000	380500	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	PI/2 BPSK	1	1	23.16	23.30	23.04	24.5	0.0
Channel				371000	376000	381000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	PI/2 BPSK	1	1	23.28	23.37	23.27	24.5	0.0
Channel				370500	376000	381500	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	PI/2 BPSK	1	1	23.03	23.37	23.32	24.5	0.0

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<n5 Ant>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				166800	167300	167300	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				834	836.5	839		
20	PI/2 BPSK	1	1	23.24	23.36	23.35	24.5	0.0
20	PI/2 BPSK	1	53	23.11	23.05	23.35		
20	PI/2 BPSK	1	104	23.31	23.10	23.32		
20	PI/2 BPSK	50	0	22.13	22.40	22.24	23.5	1.0
20	PI/2 BPSK	50	28	22.09	22.44	22.33		
20	PI/2 BPSK	50	56	22.47	22.32	22.39		
20	PI/2 BPSK	100	0	22.21	22.07	22.07	23.5	1.0
20	QPSK	1	1	23.31	23.49	23.22	24.5	0.0
20	QPSK	1	53	23.08	23.04	23.22		
20	QPSK	1	104	23.38	23.36	23.20		
20	QPSK	50	0	22.48	22.18	22.35	23.5	1.0
20	QPSK	50	28	22.14	22.14	22.16		
20	QPSK	50	56	22.18	22.46	22.10		
20	QPSK	100	0	22.44	22.38	22.08	23.5	1.0
20	16QAM	1	1	23.16	23.28	23.15	24.5	0.0
20	16QAM	1	53	23.13	23.43	23.31		
20	16QAM	1	104	23.42	23.23	23.18		
20	16QAM	50	0	22.13	22.36	22.31	23.5	1.0
20	16QAM	50	28	22.26	22.31	22.04		
20	16QAM	50	56	22.21	22.04	22.31		
20	16QAM	100	0	22.06	22.22	22.39	23.5	1.0
20	64QAM	1	1	23.40	23.15	23.25	24.5	0.0
20	64QAM	1	53	23.09	23.12	23.27		
20	64QAM	1	104	23.29	23.43	23.13		
20	64QAM	50	0	22.09	22.01	22.12	23.5	1.0
20	64QAM	50	28	22.10	22.05	22.48		
20	64QAM	50	56	22.44	22.40	22.29		
20	64QAM	100	0	22.28	22.48	22.03	23.5	1.0
20	256QAM	1	1	23.37	23.30	23.42	24.5	0.0
20	256QAM	1	53	23.35	23.18	23.30		
20	256QAM	1	104	23.44	23.12	23.15		
20	256QAM	50	0	22.47	22.21	22.08	23.5	1.0
20	256QAM	50	28	22.46	22.20	22.31		
20	256QAM	50	56	22.42	22.14	22.31		
20	256QAM	100	0	22.48	22.30	22.08	23.5	1.0
Channel				166300	167300	167800	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				831.5	836.5	841.5		
15	PI/2 BPSK	1	1	23.06	23.02	23.19	24.5	0.0
Channel				165800	167300	168200	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				829	836.5	844		
10	PI/2 BPSK	1	1	23.50	23.29	23.35	24.5	0.0
Channel				165300	167300	168700	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	PI/2 BPSK	1	1	23.31	23.03	23.15	24.5	0.0

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<n7 Ant>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				502000	507000	512000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2510	2535	2560		
20	PI/2 BPSK	1	1	23.06	23.10	23.20	24.5	0.0
20	PI/2 BPSK	1	53	23.27	23.28	23.00		
20	PI/2 BPSK	1	104	23.21	23.36	23.20		
20	PI/2 BPSK	50	0	22.03	22.35	22.36	23.5	1.0
20	PI/2 BPSK	50	28	22.20	22.41	22.08		
20	PI/2 BPSK	50	56	22.12	22.42	22.08		
20	PI/2 BPSK	100	0	22.16	22.21	22.16	23.5	1.0
20	QPSK	1	1	23.23	23.20	23.26	24.5	0.0
20	QPSK	1	53	23.06	23.08	23.19		
20	QPSK	1	104	23.03	23.23	23.42		
20	QPSK	50	0	22.32	22.13	22.46	23.5	1.0
20	QPSK	50	28	22.49	22.17	22.34		
20	QPSK	50	56	22.12	22.30	22.33		
20	QPSK	100	0	22.18	22.10	22.13	23.5	1.0
20	16QAM	1	1	23.27	23.22	23.16	24.5	0.0
20	16QAM	1	53	23.34	23.29	23.45		
20	16QAM	1	104	23.12	23.38	23.03		
20	16QAM	50	0	22.32	22.42	22.38	23.5	1.0
20	16QAM	50	28	22.32	22.15	22.09		
20	16QAM	50	56	22.27	22.22	22.42		
20	16QAM	100	0	22.45	22.13	22.33	23.5	1.0
20	64QAM	1	1	23.26	23.18	23.11	24.5	0.0
20	64QAM	1	53	23.18	23.15	23.32		
20	64QAM	1	104	23.02	23.26	23.34		
20	64QAM	50	0	22.02	22.19	22.21	23.5	1.0
20	64QAM	50	28	22.26	22.49	22.24		
20	64QAM	50	56	22.12	22.20	22.33		
20	64QAM	100	0	22.24	22.02	22.08	23.5	1.0
20	256QAM	1	1	23.11	23.20	23.27	24.5	0.0
20	256QAM	1	53	23.00	23.17	23.01		
20	256QAM	1	104	23.39	23.27	23.12		
20	256QAM	50	0	22.05	22.02	22.30	23.5	1.0
20	256QAM	50	28	22.47	22.37	22.14		
20	256QAM	50	56	22.30	22.37	22.08		
20	256QAM	100	0	22.02	22.07	22.01	23.5	1.0
Channel				501500	507000	511500	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	PI/2 BPSK	1	1	23.10	23.30	23.44	24.5	0.0
Channel				501000	507000	511000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	PI/2 BPSK	1	1	23.21	23.35	23.19	24.5	0.0
Channel				500500	507000	510500	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	PI/2 BPSK	1	1	23.05	23.45	23.22	24.5	0.0

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<n12 Ant>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				141300	141500	141700	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				706.5	707.5	708.5		
15	PI/2 BPSK	1	1	23.20	23.08	23.34	24.5	0.0
15	PI/2 BPSK	1	40	23.43	23.44	23.29		
15	PI/2 BPSK	1	78	23.33	23.11	23.15		
15	PI/2 BPSK	37	0	22.23	22.32	22.43	23.5	1.0
15	PI/2 BPSK	37	21	22.17	22.31	22.03		
15	PI/2 BPSK	37	42	22.48	22.40	22.40		
15	PI/2 BPSK	75	0	22.14	22.36	22.33	23.5	1.0
15	QPSK	1	1	23.18	23.08	23.34	24.5	0.0
15	QPSK	1	40	23.17	23.42	23.24		
15	QPSK	1	78	23.47	23.17	23.15		
15	QPSK	37	0	22.46	22.45	22.40	23.5	1.0
15	QPSK	37	21	22.48	22.46	22.47		
15	QPSK	37	42	22.21	22.13	22.32		
15	QPSK	75	0	22.13	22.21	22.21	23.5	1.0
15	16QAM	1	1	23.32	23.06	23.29	24.5	0.0
15	16QAM	1	40	23.03	23.44	23.03		
15	16QAM	1	78	23.43	23.39	23.18		
15	16QAM	37	0	22.46	22.07	22.14	23.5	1.0
15	16QAM	37	21	22.35	22.29	22.15		
15	16QAM	37	42	22.17	22.26	22.45		
15	16QAM	75	0	22.31	22.10	22.32	23.5	1.0
15	64QAM	1	1	23.38	23.44	23.04	24.5	0.0
15	64QAM	1	40	23.19	23.43	23.12		
15	64QAM	1	78	23.30	23.37	23.34		
15	64QAM	37	0	22.20	22.21	22.38	23.5	1.0
15	64QAM	37	21	22.17	22.04	22.23		
15	64QAM	37	42	22.47	22.03	22.33		
15	64QAM	75	0	22.47	22.24	22.24	23.5	1.0
15	256QAM	1	1	23.06	23.14	23.20	24.5	0.0
15	256QAM	1	40	23.33	23.14	23.46		
15	256QAM	1	78	23.14	23.04	23.25		
15	256QAM	37	0	22.17	22.01	22.14	23.5	1.0
15	256QAM	37	21	22.15	22.13	22.04		
15	256QAM	37	42	22.48	22.12	22.11		
15	256QAM	75	0	22.33	22.23	22.39	23.5	1.0
Channel				140920	141500	142080	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				704.6	707.5	710.4		
10	PI/2 BPSK	1	1	23.36	23.04	23.12	24.5	0.0
Channel				140560	141500	142440	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				702.8	707.5	712.2		
5	PI/2 BPSK	1	1	23.04	23.48	23.09	24.5	0.0

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BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				372000	376500	381000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1860	1882.5	1905		
20	PI/2 BPSK	1	1	23.41	23.42	23.23		
20	PI/2 BPSK	1	53	23.06	23.31	23.47	24.5	0.0
20	PI/2 BPSK	1	104	23.27	23.11	23.28		
20	PI/2 BPSK	50	0	22.35	22.03	22.18		
20	PI/2 BPSK	50	28	22.24	22.44	22.08	23.5	1.0
20	PI/2 BPSK	50	56	22.17	22.20	22.06		
20	PI/2 BPSK	100	0	22.48	22.25	22.19	23.5	1.0
20	QPSK	1	1	23.22	23.23	23.07		
20	QPSK	1	53	23.35	23.24	23.47	24.5	0.0
20	QPSK	1	104	23.03	23.11	23.33		
20	QPSK	50	0	22.36	22.21	22.10		
20	QPSK	50	28	22.05	22.48	22.30	23.5	1.0
20	QPSK	50	56	22.09	22.47	22.46		
20	QPSK	100	0	22.01	22.47	22.33	23.5	1.0
20	16QAM	1	1	23.30	23.23	23.23		
20	16QAM	1	53	23.49	23.20	23.06	24.5	0.0
20	16QAM	1	104	23.19	23.25	23.04		
20	16QAM	50	0	22.10	22.35	22.29		
20	16QAM	50	28	22.40	22.14	22.41	23.5	1.0
20	16QAM	50	56	22.35	22.18	22.24		
20	16QAM	100	0	22.26	22.33	22.13	23.5	1.0
20	64QAM	1	1	23.04	23.47	23.10		
20	64QAM	1	53	23.23	23.11	23.07	24.5	0.0
20	64QAM	1	104	23.23	23.08	23.37		
20	64QAM	50	0	22.16	22.18	22.36		
20	64QAM	50	28	22.44	22.39	22.04	23.5	1.0
20	64QAM	50	56	22.33	22.38	22.20		
20	64QAM	100	0	22.09	22.21	22.28	23.5	1.0
20	256QAM	1	1	23.48	23.49	23.11		
20	256QAM	1	53	23.10	23.11	23.07	24.5	0.0
20	256QAM	1	104	23.37	23.31	23.47		
20	256QAM	50	0	22.45	22.34	22.36		
20	256QAM	50	28	22.13	22.24	22.15	23.5	1.0
20	256QAM	50	56	22.09	22.15	22.41		
20	256QAM	100	0	22.12	22.16	22.21	23.5	1.0
Channel				371500	376500	381500	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1882.5	1907.5		
15	PI/2 BPSK	1	1	23.35	23.25	23.07	24.5	0.0
Channel				371000	376500	382000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1882.5	1910		
10	PI/2 BPSK	1	1	23.04	23.15	23.17	24.5	0.0
Channel				370500	376500	382500	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1882.5	1912.5		
5	PI/2 BPSK	1	1	23.35	23.04	23.30	24.5	0.0

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BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				516000	519000	522000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2580	2595	2610		
20	PI/2 BPSK	1	1	23.14	23.43	23.04	24.5	0.0
20	PI/2 BPSK	1	53	23.36	23.32	23.39		
20	PI/2 BPSK	1	104	23.17	23.43	23.18		
20	PI/2 BPSK	50	0	22.11	22.40	22.49	23.5	1.0
20	PI/2 BPSK	50	28	22.01	22.10	22.16		
20	PI/2 BPSK	50	56	22.11	22.35	22.45		
20	PI/2 BPSK	100	0	22.47	22.35	22.22	23.5	1.0
20	QPSK	1	1	23.39	23.35	23.21	24.5	0.0
20	QPSK	1	53	23.20	23.03	23.46		
20	QPSK	1	104	23.09	23.07	23.09		
20	QPSK	50	0	22.46	22.08	22.09	23.5	1.0
20	QPSK	50	28	22.08	22.00	22.17		
20	QPSK	50	56	22.48	22.18	22.44		
20	QPSK	100	0	22.09	22.15	22.45	23.5	1.0
20	16QAM	1	1	23.12	23.34	23.17	24.5	0.0
20	16QAM	1	53	23.40	23.42	23.26		
20	16QAM	1	104	23.35	23.37	23.20		
20	16QAM	50	0	22.05	22.20	22.37	23.5	1.0
20	16QAM	50	28	22.45	22.19	22.35		
20	16QAM	50	56	22.33	22.05	22.29		
20	16QAM	100	0	22.48	22.23	22.36	23.5	1.0
20	64QAM	1	1	23.28	23.47	23.45	24.5	0.0
20	64QAM	1	53	23.03	23.40	23.40		
20	64QAM	1	104	23.14	23.27	23.25		
20	64QAM	50	0	22.16	22.06	22.16	23.5	1.0
20	64QAM	50	28	22.20	22.46	22.44		
20	64QAM	50	56	22.34	22.14	22.32		
20	64QAM	100	0	22.36	22.10	22.05	23.5	1.0
20	256QAM	1	1	23.32	23.41	23.08	24.5	0.0
20	256QAM	1	53	23.38	23.38	23.11		
20	256QAM	1	104	23.01	23.36	23.39		
20	256QAM	50	0	22.50	22.13	22.28	23.5	1.0
20	256QAM	50	28	22.15	22.28	22.14		
20	256QAM	50	56	22.15	22.38	22.37		
20	256QAM	100	0	22.45	22.34	22.18	23.5	1.0
Channel				515500	519000	522500	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2577.5	2595	2612.5		
15	PI/2 BPSK	1	1	23.01	23.11	23.18	24.5	0.0
Channel				515000	519000	523000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2575	2595	2615		
10	PI/2 BPSK	1	1	23.12	23.17	23.04	24.5	0.0
Channel				514500	519000	523500	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2572.5	2595	2617.5		
5	PI/2 BPSK	1	1	23.29	23.15	23.45	24.5	0.0

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BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				637333	641666	646000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3560	3625	3690		
20	PI/2 BPSK	1	1	23.20	23.31	23.03		
20	PI/2 BPSK	1	53	23.28	23.32	23.02	24.5	0.0
20	PI/2 BPSK	1	104	23.16	23.45	23.34		
20	PI/2 BPSK	50	0	22.46	22.23	22.01		
20	PI/2 BPSK	50	28	22.04	22.08	22.40	23.5	1.0
20	PI/2 BPSK	50	56	22.17	22.46	22.26		
20	PI/2 BPSK	100	0	22.12	22.32	22.15	23.5	1.0
20	QPSK	1	1	23.16	23.18	23.35		
20	QPSK	1	53	23.22	23.22	23.11	24.5	0.0
20	QPSK	1	104	23.17	23.48	23.40		
20	QPSK	50	0	22.44	22.49	22.31		
20	QPSK	50	28	22.22	22.38	22.33	23.5	1.0
20	QPSK	50	56	22.39	22.09	22.37		
20	QPSK	100	0	22.24	22.47	22.13	23.5	1.0
20	16QAM	1	1	23.03	23.18	23.14		
20	16QAM	1	53	23.08	23.06	23.15	24.5	0.0
20	16QAM	1	104	23.20	23.23	23.31		
20	16QAM	50	0	22.19	22.09	22.12		
20	16QAM	50	28	22.30	22.45	22.48	23.5	1.0
20	16QAM	50	56	22.17	22.11	22.03		
20	16QAM	100	0	22.46	22.46	22.14	23.5	1.0
20	64QAM	1	1	23.39	23.10	23.31		
20	64QAM	1	53	23.43	23.17	23.36	24.5	0.0
20	64QAM	1	104	23.20	23.45	23.44		
20	64QAM	50	0	22.33	22.11	22.00		
20	64QAM	50	28	22.03	22.43	22.05	23.5	1.0
20	64QAM	50	56	22.35	22.36	22.04		
20	64QAM	100	0	22.37	22.44	22.04	23.5	1.0
20	256QAM	1	1	23.49	23.38	23.13		
20	256QAM	1	53	23.48	23.42	23.40	24.5	0.0
20	256QAM	1	104	23.25	23.03	23.46		
20	256QAM	50	0	22.35	22.07	22.41		
20	256QAM	50	28	22.45	22.32	22.45	23.5	1.0
20	256QAM	50	56	22.49	22.01	22.28		
20	256QAM	100	0	22.30	22.20	22.34	23.5	1.0
Channel				371500	376500	381500	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1882.5	1907.5		
15	PI/2 BPSK	1	1	23.39	23.26	23.12	24.5	0.0
Channel				371000	376500	382000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1882.5	1910		
10	PI/2 BPSK	1	1	23.48	23.46	23.07	24.5	0.0
Channel				370500	376500	382500	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1882.5	1912.5		
5	PI/2 BPSK	1	1	23.34	23.10	23.23	24.5	0.0

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BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				344000	349000	354000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1720	1745	1770		
20	PI/2 BPSK	1	1	23.40	23.30	23.30	24.5	0.0
20	PI/2 BPSK	1	53	23.14	23.19	23.13		
20	PI/2 BPSK	1	104	23.49	23.46	23.47		
20	PI/2 BPSK	50	0	22.17	22.09	22.13	23.5	1.0
20	PI/2 BPSK	50	28	22.12	22.26	22.42		
20	PI/2 BPSK	50	56	22.08	22.09	22.22		
20	PI/2 BPSK	100	0	22.32	22.06	22.02	23.5	1.0
20	QPSK	1	1	23.37	23.40	23.20	24.5	0.0
20	QPSK	1	53	23.03	23.26	23.47		
20	QPSK	1	104	23.40	23.40	23.20		
20	QPSK	50	0	22.21	22.01	22.14	23.5	1.0
20	QPSK	50	28	22.26	22.50	22.38		
20	QPSK	50	56	22.08	22.12	22.07		
20	QPSK	100	0	22.07	22.24	22.24	23.5	1.0
20	16QAM	1	1	23.29	23.31	23.06	24.5	0.0
20	16QAM	1	53	23.24	23.23	23.01		
20	16QAM	1	104	23.18	23.30	23.09		
20	16QAM	50	0	22.26	22.25	22.34	23.5	1.0
20	16QAM	50	28	22.21	22.36	22.26		
20	16QAM	50	56	22.04	22.47	22.40		
20	16QAM	100	0	22.21	22.44	22.20	23.5	1.0
20	64QAM	1	1	23.20	23.07	23.21	24.5	0.0
20	64QAM	1	53	23.22	23.42	23.13		
20	64QAM	1	104	23.10	23.28	23.13		
20	64QAM	50	0	22.22	22.41	22.36	23.5	1.0
20	64QAM	50	28	22.33	22.01	22.04		
20	64QAM	50	56	22.36	22.28	22.04		
20	64QAM	100	0	22.35	22.09	22.06	23.5	1.0
20	256QAM	1	1	23.02	23.29	23.17	24.5	0.0
20	256QAM	1	53	23.12	23.15	23.44		
20	256QAM	1	104	23.22	23.39	23.28		
20	256QAM	50	0	22.48	22.07	22.05	23.5	1.0
20	256QAM	50	28	22.21	22.00	22.38		
20	256QAM	50	56	22.15	22.07	22.43		
20	256QAM	100	0	22.30	22.05	22.40	23.5	1.0
Channel				343500	349000	354500	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1745	1772.5		
15	PI/2 BPSK	1	1	23.19	23.26	23.29	24.5	0.0
Channel				343000	349000	355000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1745	1775		
10	PI/2 BPSK	1	1	23.02	23.17	23.38	24.5	0.0
Channel				342500	349000	355500	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1745	1777.5		
5	PI/2 BPSK	1	1	23.18	23.08	23.47	24.5	0.0

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BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				134600	136100	137600	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				673	680.5	688		
20	PI/2 BPSK	1	1	23.14	23.19	23.06		
20	PI/2 BPSK	1	53	23.06	23.01	23.40	24.5	0.0
20	PI/2 BPSK	1	104	23.45	23.05	23.12		
20	PI/2 BPSK	50	0	22.24	22.18	22.50		
20	PI/2 BPSK	50	28	22.10	22.20	22.38	23.5	1.0
20	PI/2 BPSK	50	56	22.22	22.50	22.34		
20	PI/2 BPSK	100	0	22.35	22.35	22.49	23.5	1.0
20	QPSK	1	1	23.06	23.11	23.33		
20	QPSK	1	53	23.15	23.02	23.00	24.5	0.0
20	QPSK	1	104	23.35	23.27	23.02		
20	QPSK	50	0	22.17	22.16	22.33		
20	QPSK	50	28	22.45	22.07	22.36	23.5	1.0
20	QPSK	50	56	22.24	22.14	22.36		
20	QPSK	100	0	22.28	22.13	22.04	23.5	1.0
20	16QAM	1	1	23.39	23.14	23.11		
20	16QAM	1	53	23.42	23.12	23.33	24.5	0.0
20	16QAM	1	104	23.07	23.40	23.34		
20	16QAM	50	0	22.23	22.36	22.15		
20	16QAM	50	28	22.41	22.08	22.02	23.5	1.0
20	16QAM	50	56	22.46	22.00	22.14		
20	16QAM	100	0	22.02	22.25	22.02	23.5	1.0
20	64QAM	1	1	23.27	23.30	23.07		
20	64QAM	1	53	23.29	23.05	23.12	24.5	0.0
20	64QAM	1	104	23.06	23.45	23.16		
20	64QAM	50	0	22.12	22.24	22.47		
20	64QAM	50	28	22.02	22.44	22.20	23.5	1.0
20	64QAM	50	56	22.08	22.26	22.15		
20	64QAM	100	0	22.30	22.41	22.14	23.5	1.0
20	256QAM	1	1	23.32	23.30	23.24		
20	256QAM	1	53	23.44	23.18	23.44	24.5	0.0
20	256QAM	1	104	23.15	23.11	23.15		
20	256QAM	50	0	22.01	22.10	22.12		
20	256QAM	50	28	22.30	22.05	22.14	23.5	1.0
20	256QAM	50	56	22.42	22.36	22.34		
20	256QAM	100	0	22.19	22.37	22.17	23.5	1.0
Channel				134100	136100	138100	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				670.5	680.5	690.5		
15	PI/2 BPSK	1	1	23.12	23.41	23.29	24.5	0.0
Channel				133600	136100	138600	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				668	680.5	693		
10	PI/2 BPSK	1	1	23.22	23.33	23.00	24.5	0.0
Channel				133100	136100	139100	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				665.5	680.5	685.5		
5	PI/2 BPSK	1	1	23.45	23.39	23.43	24.5	0.0

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BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				620666	646720	679333	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3310	3750	4190		
20	PI/2 BPSK	1	1	24.06	24.24	24.17		
20	PI/2 BPSK	1	53	24.35	24.18	24.27	24.5	0.0
20	PI/2 BPSK	1	104	24.08	24.32	24.34		
20	PI/2 BPSK	50	0	23.06	23.30	23.25		
20	PI/2 BPSK	50	28	23.46	23.46	23.45	23.5	1.0
20	PI/2 BPSK	50	56	23.22	23.14	23.10		
20	PI/2 BPSK	100	0	23.35	23.28	23.18	23.5	1.0
20	QPSK	1	1	24.18	24.29	24.08		
20	QPSK	1	53	24.18	24.48	24.04	24.5	0.0
20	QPSK	1	104	24.45	24.24	24.10		
20	QPSK	50	0	23.38	23.25	23.37		
20	QPSK	50	28	23.11	23.24	23.16	23.5	1.0
20	QPSK	50	56	23.47	23.42	23.09		
20	QPSK	100	0	23.36	23.21	23.33	23.5	1.0
20	16QAM	1	1	24.29	24.07	24.01		
20	16QAM	1	53	24.26	24.44	24.33	24.5	0.0
20	16QAM	1	104	24.06	24.39	24.29		
20	16QAM	50	0	23.06	23.08	23.42		
20	16QAM	50	28	23.17	23.17	23.02	23.5	1.0
20	16QAM	50	56	23.23	23.24	23.40		
20	16QAM	100	0	23.11	23.47	23.07	23.5	1.0
20	64QAM	1	1	24.18	24.29	24.11		
20	64QAM	1	53	24.35	24.08	24.39	24.5	0.0
20	64QAM	1	104	24.08	24.14	24.42		
20	64QAM	50	0	23.20	23.28	23.30		
20	64QAM	50	28	23.28	23.26	23.09	23.5	1.0
20	64QAM	50	56	23.05	23.25	23.33		
20	64QAM	100	0	23.47	23.29	23.29	23.5	1.0
20	256QAM	1	1	24.35	24.18	24.38		
20	256QAM	1	53	24.45	24.48	24.40	24.5	0.0
20	256QAM	1	104	24.07	24.02	24.42		
20	256QAM	50	0	23.31	23.08	23.49		
20	256QAM	50	28	23.10	23.08	23.26	23.5	1.0
20	256QAM	50	56	23.13	23.25	23.27		
20	256QAM	100	0	23.07	23.11	23.07	23.5	1.0
Channel				620166	646720	679833	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3307.5	3750	4192.5		
15	PI/2 BPSK	1	1	24.49	24.41	24.10	24.5	0.0
Channel				619666	646720	680333	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3305	3750	4195		
10	PI/2 BPSK	1	1	24.48	24.02	24.32	24.5	0.0
Channel				619166	646720	680833	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3302.5	3750	4197.5		
5	PI/2 BPSK	1	1	24.01	24.28	24.21	24.5	0.0

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<n78 Ant>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				620666	636667	652666	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3310	3550	3790		
20	PI/2 BPSK	1	1	24.29	24.49	24.11	24.5	0.0
20	PI/2 BPSK	1	53	24.49	24.24	24.22		
20	PI/2 BPSK	1	104	24.19	24.02	24.11		
20	PI/2 BPSK	50	0	23.34	23.18	23.07	23.5	1.0
20	PI/2 BPSK	50	28	23.32	23.43	23.26		
20	PI/2 BPSK	50	56	23.05	23.17	23.34		
20	PI/2 BPSK	100	0	23.29	23.37	23.33	23.5	1.0
20	QPSK	1	1	24.39	24.02	24.45	24.5	0.0
20	QPSK	1	53	24.10	24.10	24.34		
20	QPSK	1	104	24.47	24.11	24.40		
20	QPSK	50	0	23.34	23.47	23.23	23.5	1.0
20	QPSK	50	28	23.02	23.20	23.50		
20	QPSK	50	56	23.05	23.45	23.49		
20	QPSK	100	0	23.10	23.12	23.03	23.5	1.0
20	16QAM	1	1	24.21	24.04	24.13	24.5	0.0
20	16QAM	1	53	24.20	24.36	24.01		
20	16QAM	1	104	24.13	24.11	24.22		
20	16QAM	50	0	23.01	23.43	23.46	23.5	1.0
20	16QAM	50	28	23.49	23.32	23.20		
20	16QAM	50	56	23.03	23.28	23.49		
20	16QAM	100	0	23.34	23.33	23.28	23.5	1.0
20	64QAM	1	1	24.10	24.06	24.50	24.5	0.0
20	64QAM	1	53	24.44	24.44	24.16		
20	64QAM	1	104	24.16	24.10	24.15		
20	64QAM	50	0	23.14	23.42	23.20	23.5	1.0
20	64QAM	50	28	23.05	23.15	23.11		
20	64QAM	50	56	23.17	23.12	23.34		
20	64QAM	100	0	23.30	23.15	23.46	23.5	1.0
20	256QAM	1	1	24.12	24.46	24.28	24.5	0.0
20	256QAM	1	53	24.11	24.20	24.50		
20	256QAM	1	104	24.05	24.39	24.38		
20	256QAM	50	0	23.18	23.16	23.42	23.5	1.0
20	256QAM	50	28	23.42	23.28	23.19		
20	256QAM	50	56	23.14	23.30	23.13		
20	256QAM	100	0	23.19	23.01	23.39	23.5	1.0
Channel				620166	646720	679833	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3307.5	3750	4192.5		
15	PI/2 BPSK	1	1	24.37	24.45	24.44	24.5	0.0
Channel				619666	646720	680333	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3305	3750	4195		
10	PI/2 BPSK	1	1	24.37	24.36	24.19	24.5	0.0
Channel				619166	646720	680833	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				3302.5	3750	4197.5		
5	PI/2 BPSK	1	1	24.46	24.43	24.15	24.5	0.0

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9. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
2. Per KDB 447498 D01v06, for each exposure position, 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
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.

FR1 Note:

1. For 5G NR test procedure was following step similar FCC KDB 941225 D05:
   a. SAR testing start with the largest channel bandwidth and measure SAR for PI/2 BPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
   b. 50% RB allocation for PI/2 BPSK SAR testing follows 1RB PI/2 BPSK allocation procedure
   c. PI/2 BPSK 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 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.
   d. QPSK/16QAM/64QAM/256QAM output powers are not ½ dB higher than the same configuration in PI/2 BPSK, also reported SAR for the PI/2 BPSK configuration is less than 1.45 W/kg, QPSK/16QAM/64QAM/256QAM SAR testing are not required.
   e. Smaller bandwidth output power for each RB allocation configuration for this device will not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg, smaller bandwidth SAR testing is not required for this device
   f. For 5G FR1 n5/n12/n41/n71 the maximum bandwidth does not support three non-overlapping channels, 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.
2. Due to test setup limitations, SAR testing for NR was performed using Factory Test Mode software to establish the connection and perform SAR with 100% duty cycle. AT Commands were used to establish the connection.

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Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	FR1 Band 2_Ant M1	20M	BPSK	1	53	Back	15mm	376000	1880	23.43	24.50	0.0844	0.11
	FR1 Band 2_Ant M1	20M	BPSK	50	28	Back	15mm	376000	1880	22.22	23.50	0.0749	0.10
	FR1 Band 2_Ant M2	20M	BPSK	1	53	Back	15mm	376000	1880	23.43	24.50	0.273	0.35
	FR1 Band 2_Ant M2	20M	BPSK	50	28	Back	15mm	376000	1880	22.22	23.50	0.166	0.22
	FR1 Band 2_Ant M3	20M	BPSK	1	53	Back	15mm	376000	1880	23.43	24.50	0.0859	0.11
	FR1 Band 2_Ant M3	20M	BPSK	50	28	Back	15mm	376000	1880	22.22	23.50	0.0736	0.10
	FR1 Band 2_Ant M4	20M	BPSK	1	53	Back	15mm	376000	1880	23.43	24.50	0.261	0.33
	FR1 Band 2_Ant M4	20M	BPSK	50	28	Back	15mm	376000	1880	22.22	23.50	0.161	0.22
	FR1 Band 2_Ant M5	20M	BPSK	1	53	Back	15mm	376000	1880	23.43	24.50	0.267	0.34
	FR1 Band 2_Ant M5	20M	BPSK	50	28	Back	15mm	376000	1880	22.22	23.50	0.158	0.21
	FR1 Band 2_Ant M6	20M	BPSK	1	53	Back	15mm	376000	1880	23.43	24.50	0.0871	0.11
	FR1 Band 2_Ant M6	20M	BPSK	50	28	Back	15mm	376000	1880	22.22	23.50	0.0753	0.10
	FR1 Band 5_Ant M1	20M	BPSK	1	53	Back	15mm	167300	836.5	23.05	24.50	0.0699	0.10
	FR1 Band 5_Ant M1	20M	BPSK	50	28	Back	15mm	167300	836.5	22.44	23.50	0.0601	0.08
1	FR1 Band 5_Ant M2	20M	BPSK	1	53	Back	15mm	167300	836.5	23.05	24.50	0.196	0.27
	FR1 Band 5_Ant M2	20M	BPSK	50	28	Back	15mm	167300	836.5	22.44	23.50	0.0923	0.12
	FR1 Band 5_Ant M3	20M	BPSK	1	53	Back	15mm	167300	836.5	23.05	24.50	0.0705	0.10
	FR1 Band 5_Ant M3	20M	BPSK	50	28	Back	15mm	167300	836.5	22.44	23.50	0.0611	0.08
	FR1 Band 5_Ant M4	20M	BPSK	1	53	Back	15mm	167300	836.5	23.05	24.50	0.187	0.26
	FR1 Band 5_Ant M4	20M	BPSK	50	28	Back	15mm	167300	836.5	22.44	23.50	0.0915	0.12
	FR1 Band 5_Ant M5	20M	BPSK	1	53	Back	15mm	167300	836.5	23.05	24.50	0.192	0.27
	FR1 Band 5_Ant M5	20M	BPSK	50	28	Back	15mm	167300	836.5	22.44	23.50	0.0906	0.12
	FR1 Band 5_Ant M6	20M	BPSK	1	53	Back	15mm	167300	836.5	23.05	24.50	0.0714	0.10
	FR1 Band 5_Ant M6	20M	BPSK	50	28	Back	15mm	167300	836.5	22.44	23.50	0.0603	0.08
	FR1 Band 7_Ant M1	20M	BPSK	1	53	Back	15mm	507000	2535	23.28	24.50	0.0988	0.13
	FR1 Band 7_Ant M1	20M	BPSK	50	28	Back	15mm	507000	2535	22.41	23.50	0.0896	0.12
2	FR1 Band 7_Ant M2	20M	BPSK	1	53	Back	15mm	507000	2535	23.28	24.50	0.475	0.63
	FR1 Band 7_Ant M2	20M	BPSK	50	28	Back	15mm	507000	2535	22.41	23.50	0.326	0.42
	FR1 Band 7_Ant M3	20M	BPSK	1	53	Back	15mm	507000	2535	23.28	24.50	0.0991	0.13
	FR1 Band 7_Ant M3	20M	BPSK	50	28	Back	15mm	507000	2535	22.41	23.50	0.0899	0.12
	FR1 Band 7_Ant M4	20M	BPSK	1	53	Back	15mm	507000	2535	23.28	24.50	0.469	0.62
	FR1 Band 7_Ant M4	20M	BPSK	50	28	Back	15mm	507000	2535	22.41	23.50	0.321	0.41
	FR1 Band 7_Ant M5	20M	BPSK	1	53	Back	15mm	507000	2535	23.28	24.50	0.472	0.63
	FR1 Band 7_Ant M5	20M	BPSK	50	28	Back	15mm	507000	2535	22.41	23.50	0.319	0.41
	FR1 Band 7_Ant M6	20M	BPSK	1	53	Back	15mm	507000	2535	23.28	24.50	0.102	0.14
	FR1 Band 7_Ant M6	20M	BPSK	50	28	Back	15mm	507000	2535	22.41	23.50	0.0902	0.12
	FR1 Band 12_Ant M1	15M	BPSK	1	40	Back	15mm	141500	707.5	23.44	24.50	0.142	0.18
	FR1 Band 12_Ant M1	15M	BPSK	37	21	Back	15mm	141500	707.5	22.31	23.50	0.0552	0.07
3	FR1 Band 12_Ant M2	15M	BPSK	1	40	Back	15mm	141500	707.5	23.44	24.50	0.303	0.39
	FR1 Band 12_Ant M2	15M	BPSK	37	21	Back	15mm	141500	707.5	22.31	23.50	0.211	0.28
	FR1 Band 12_Ant M3	15M	BPSK	1	40	Back	15mm	141500	707.5	23.44	24.50	0.139	0.18
	FR1 Band 12_Ant M3	15M	BPSK	37	21	Back	15mm	141500	707.5	22.31	23.50	0.0563	0.07
	FR1 Band 12_Ant M4	15M	BPSK	1	40	Back	15mm	141500	707.5	23.44	24.50	0.296	0.38
	FR1 Band 12_Ant M4	15M	BPSK	37	21	Back	15mm	141500	707.5	22.31	23.50	0.205	0.27
	FR1 Band 12_Ant M5	15M	BPSK	1	40	Back	15mm	141500	707.5	23.44	24.50	0.291	0.37
	FR1 Band 12_Ant M5	15M	BPSK	37	21	Back	15mm	141500	707.5	22.31	23.50	0.203	0.27
	FR1 Band 12_Ant M6	15M	BPSK	1	40	Back	15mm	141500	707.5	23.44	24.50	0.149	0.19
	FR1 Band 12_Ant M6	15M	BPSK	37	21	Back	15mm	141500	707.5	22.31	23.50	0.0561	0.07

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Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	FR1 Band 25_Ant M1	20M	QPSK	1	53	Back	15mm	376500	1882.5	23.31	24.50	0.0856	0.11
	FR1 Band 25_Ant M1	20M	QPSK	50	28		15mm	376500	1882.5	22.44	23.50	0.0759	0.10
4	FR1 Band 25_Ant M2	20M	QPSK	1	53	Back	15mm	376500	1882.5	23.31	24.50	0.277	0.36
	FR1 Band 25_Ant M2	20M	QPSK	50	28		15mm	376500	1882.5	22.44	23.50	0.168	0.21
	FR1 Band 25_Ant M3	20M	QPSK	1	53	Back	15mm	376500	1882.5	23.31	24.50	0.0871	0.12
	FR1 Band 25_Ant M3	20M	QPSK	50	28		15mm	376500	1882.5	22.44	23.50	0.0746	0.10
	FR1 Band 25_Ant M4	20M	QPSK	1	53	Back	15mm	376500	1882.5	23.31	24.50	0.265	0.35
	FR1 Band 25_Ant M4	20M	QPSK	50	28		15mm	376500	1882.5	22.44	23.50	0.163	0.21
	FR1 Band 25_Ant M5	20M	QPSK	1	53	Back	15mm	376500	1882.5	23.31	24.50	0.271	0.36
	FR1 Band 25_Ant M5	20M	QPSK	50	28		15mm	376500	1882.5	22.44	23.50	0.160	0.20
	FR1 Band 25_Ant M6	20M	QPSK	1	53	Back	15mm	376500	1882.5	23.31	24.50	0.0883	0.12
	FR1 Band 25_Ant M6	20M	QPSK	50	28		15mm	376500	1882.5	22.44	23.50	0.0763	0.10
	FR1 Band 38_Ant M1	20M	QPSK	1	53	Back	15mm	520000	2595	23.32	24.50	0.0341	0.04
	FR1 Band 38_Ant M1	20M	QPSK	50	28		15mm	520000	2595	22.10	23.50	0.0241	0.03
5	FR1 Band 38_Ant M2	20M	QPSK	1	53	Back	15mm	520000	2595	23.32	24.50	0.498	0.65
	FR1 Band 38_Ant M2	20M	QPSK	50	28		15mm	520000	2595	22.10	23.50	0.377	0.52
	FR1 Band 38_Ant M3	20M	QPSK	1	53	Back	15mm	520000	2595	23.32	24.50	0.0349	0.05
	FR1 Band 38_Ant M3	20M	QPSK	50	28		15mm	520000	2595	22.10	23.50	0.0238	0.03
	FR1 Band 38_Ant M4	20M	QPSK	1	53	Back	15mm	520000	2595	23.32	24.50	0.485	0.64
	FR1 Band 38_Ant M4	20M	QPSK	50	28		15mm	520000	2595	22.10	23.50	0.365	0.50
	FR1 Band 38_Ant M5	20M	QPSK	1	53	Back	15mm	520000	2595	23.32	24.50	0.491	0.64
	FR1 Band 38_Ant M5	20M	QPSK	50	28		15mm	520000	2595	22.10	23.50	0.369	0.51
	FR1 Band 38_Ant M6	20M	QPSK	1	53	Back	15mm	520000	2595	23.32	24.50	0.0353	0.05
	FR1 Band 38_Ant M6	20M	QPSK	50	28		15mm	520000	2595	22.10	23.50	0.0249	0.03
	FR1 Band 48_Ant M1	20M	QPSK	1	53	Back	15mm	641666	3625	23.32	24.50	0.0923	0.12
	FR1 Band 48_Ant M1	20M	QPSK	50	28		15mm	641666	3625	22.08	23.50	0.0811	0.11
6	FR1 Band 48_Ant M2	20M	QPSK	1	53	Back	15mm	641666	3625	23.32	24.50	0.450	0.59
	FR1 Band 48_Ant M2	20M	QPSK	50	28		15mm	641666	3625	22.08	23.50	0.338	0.47
	FR1 Band 48_Ant M3	20M	QPSK	1	53	Back	15mm	641666	3625	23.32	24.50	0.0904	0.12
	FR1 Band 48_Ant M3	20M	QPSK	50	28		15mm	641666	3625	22.08	23.50	0.0824	0.11
	FR1 Band 48_Ant M4	20M	QPSK	1	53	Back	15mm	641666	3625	23.32	24.50	0.441	0.58
	FR1 Band 48_Ant M4	20M	QPSK	50	28		15mm	641666	3625	22.08	23.50	0.329	0.46
	FR1 Band 48_Ant M5	20M	QPSK	1	53	Back	15mm	641666	3625	23.32	24.50	0.439	0.58
	FR1 Band 48_Ant M5	20M	QPSK	50	28		15mm	641666	3625	22.08	23.50	0.320	0.44
	FR1 Band 48_Ant M6	20M	QPSK	1	53	Back	15mm	641666	3625	23.32	24.50	0.0956	0.13
	FR1 Band 48_Ant M6	20M	QPSK	50	28		15mm	641666	3625	22.08	23.50	0.0826	0.11
	FR1 Band 66_Ant M1	20M	BPSK	1	53	Back	15mm	349000	1745	23.19	24.50	0.0423	0.06
	FR1 Band 66_Ant M1	20M	BPSK	50	28		15mm	349000	1745	22.26	23.50	0.0336	0.04
	FR1 Band 66_Ant M2	20M	BPSK	1	53	Back	15mm	344000	1720	23.14	24.50	0.412	0.56
7	FR1 Band 66_Ant M2	20M	BPSK	1	53		15mm	349000	1745	23.19	24.50	0.499	0.67
	FR1 Band 66_Ant M2	20M	BPSK	1	53		15mm	354000	1770	23.13	24.50	0.468	0.64
	FR1 Band 66_Ant M2	20M	BPSK	50	28		15mm	349000	1745	22.26	23.50	0.382	0.51
	FR1 Band 66_Ant M3	20M	BPSK	1	53	Back	15mm	349000	1745	23.19	24.50	0.0411	0.06
	FR1 Band 66_Ant M3	20M	BPSK	50	28		15mm	349000	1745	22.26	23.50	0.0314	0.04
	FR1 Band 66_Ant M4	20M	BPSK	1	53	Back	15mm	349000	1745	23.19	24.50	0.452	0.61
	FR1 Band 66_Ant M4	20M	BPSK	50	28		15mm	349000	1745	22.26	23.50	0.326	0.43
	FR1 Band 66_Ant M5	20M	BPSK	1	53	Back	15mm	349000	1745	23.19	24.50	0.487	0.66
	FR1 Band 66_Ant M5	20M	BPSK	50	28		15mm	349000	1745	22.26	23.50	0.364	0.48
	FR1 Band 66_Ant M6	20M	BPSK	1	53	Back	15mm	349000	1745	23.19	24.50	0.0445	0.06
	FR1 Band 66_Ant M6	20M	BPSK	50	28		15mm	349000	1745	22.26	23.50	0.0326	0.04

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Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	FR1 Band 71_Ant M1	20M	BPSK	1	53	Back	15mm	136100	680.5	23.01	24.50	0.0768	0.11
	FR1 Band 71_Ant M1	20M	BPSK	50	28		15mm	136100	680.5	22.20	23.50	0.0658	0.09
8	FR1 Band 71_Ant M2	20M	BPSK	1	53	Back	15mm	136100	680.5	23.01	24.50	0.268	0.38
	FR1 Band 71_Ant M2	20M	BPSK	50	28		15mm	136100	680.5	22.20	23.50	0.136	0.18
	FR1 Band 71_Ant M3	20M	BPSK	1	53	Back	15mm	136100	680.5	23.01	24.50	0.0743	0.11
	FR1 Band 71_Ant M3	20M	BPSK	50	28		15mm	136100	680.5	22.20	23.50	0.0628	0.09
	FR1 Band 71_Ant M4	20M	BPSK	1	53	Back	15mm	136100	680.5	23.01	24.50	0.259	0.37
	FR1 Band 71_Ant M4	20M	BPSK	50	28		15mm	136100	680.5	22.20	23.50	0.128	0.17
	FR1 Band 71_Ant M5	20M	BPSK	1	53	Back	15mm	136100	680.5	23.01	24.50	0.261	0.37
	FR1 Band 71_Ant M5	20M	BPSK	50	28		15mm	136100	680.5	22.20	23.50	0.126	0.17
	FR1 Band 71_Ant M6	20M	BPSK	1	53	Back	15mm	136100	680.5	23.01	24.50	0.0802	0.11
	FR1 Band 71_Ant M6	20M	BPSK	50	28		15mm	136100	680.5	22.20	23.50	0.0697	0.09
	FR1 Band 77_Ant M1	20M	BPSK	1	53	Back	15mm	518601	2593	24.18	24.50	0.0952	0.10
	FR1 Band 77_Ant M1	20M	BPSK	50	28		15mm	518601	2593	23.46	23.50	0.0871	0.09
9	FR1 Band 77_Ant M2	20M	BPSK	1	53	Back	15mm	518601	2593	24.18	24.50	0.542	0.58
	FR1 Band 77_Ant M2	20M	BPSK	50	28		15mm	518601	2593	23.46	23.50	0.436	0.44
	FR1 Band 77_Ant M3	20M	BPSK	1	53	Back	15mm	501200	2506	24.18	24.50	0.0964	0.10
	FR1 Band 77_Ant M3	20M	BPSK	50	28		15mm	518601	2593	23.46	24.50	0.0856	0.11
	FR1 Band 77_Ant M4	20M	BPSK	1	53	Back	15mm	536000	2680	24.18	24.50	0.533	0.57
	FR1 Band 77_Ant M4	20M	BPSK	50	28		15mm	518601	2593	23.46	23.50	0.427	0.43
	FR1 Band 77_Ant M5	20M	BPSK	1	53	Back	15mm	518601	2593	24.18	21.50	0.537	0.29
	FR1 Band 77_Ant M5	20M	BPSK	50	28		15mm	518601	2593	23.46	21.50	0.430	0.27
	FR1 Band 77_Ant M6	20M	BPSK	1	53	Back	15mm	518601	2593	24.18	21.50	0.0989	0.05
	FR1 Band 77_Ant M6	20M	BPSK	50	28		15mm	518601	2593	23.46	21.50	0.0876	0.06

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10. Simultaneous Transmission Analysis

The 3G/4G/WiFi data is located in report number SAR.20230905. The data listed in the tables below was extracted from the report filed with this report.

Sim-Tx configuration

No.	Simultaneous Transmission Configuration	Exposure Positions
		Body
1	UMTS + 2.4 GHz Wifi W1 + 2.4 GHz WiFi W2	Yes
2	UMTS + 5 GHz Wifi W1 + 5 GHz WiFi W2	Yes
3	LTE + 2.4 GHz Wifi W1 + 2.4 GHz WiFi W2	Yes
4	LTE + 5 GHz Wifi W1 + 5 GHz WiFi W2	Yes
5	FR1 + 2.4 GHz Wifi W1 + 2.4 GHz WiFi W2	Yes
6	FR1 + 5 GHz Wifi W1 + 5 GHz WiFi W2	Yes

General Note:

1. The following summations represent the absolute worst cases for simultaneous transmission with WWAN and WLAN.
2. The Scaled SAR summation is calculated based on the same configuration and test position.

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Body Exposure Conditions

WWAN Band	Antenna	Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz Wi-Fi W1 1g SAR (W/kg)	3 2.4GHz Wi-Fi W2 1g SAR (W/kg)	4 5GHz Wi-Fi W1 1g SAR (W/kg)	5 5GHz Wi-Fi W2 1g SAR (W/kg)	1+2+3 Summed 1g SAR (W/kg)	1+4+5 Summed 1g SAR (W/kg)
WCDMA Band 2	M1	Back	0.12	0.01	0.05	0.01	0.31	0.18	0.44
	M2		0.90	0.01	0.05	0.01	0.31	0.96	1.22
	M3		0.13	0.01	0.05	0.01	0.31	0.19	0.45
	M4		0.87	0.01	0.05	0.01	0.31	0.93	1.19
	M5		0.88	0.01	0.05	0.01	0.31	0.94	1.20
	M6		0.17	0.01	0.05	0.01	0.31	0.23	0.49
WCDMA Band 4	M1		0.06	0.01	0.05	0.01	0.31	0.12	0.38
	M2		0.58	0.01	0.05	0.01	0.31	0.64	0.90
	M3		0.07	0.01	0.05	0.01	0.31	0.13	0.39
	M4		0.55	0.01	0.05	0.01	0.31	0.61	0.87
	M5		0.57	0.01	0.05	0.01	0.31	0.63	0.89
	M6		0.08	0.01	0.05	0.01	0.31	0.14	0.40
WCDMA Band 5	M1		0.09	0.01	0.05	0.01	0.31	0.15	0.41
	M2		0.32	0.01	0.05	0.01	0.31	0.38	0.64
	M3		0.09	0.01	0.05	0.01	0.31	0.15	0.41
	M4		0.30	0.01	0.05	0.01	0.31	0.36	0.62
	M5		0.29	0.01	0.05	0.01	0.31	0.35	0.61
	M6		0.09	0.01	0.05	0.01	0.31	0.15	0.41
LTE Band 2	M1		0.13	0.01	0.05	0.01	0.31	0.19	0.45
	M2		0.51	0.01	0.05	0.01	0.31	0.57	0.83
	M3		0.13	0.01	0.05	0.01	0.31	0.19	0.45
	M4		0.50	0.01	0.05	0.01	0.31	0.56	0.82
	M5		0.51	0.01	0.05	0.01	0.31	0.57	0.83
	M6		0.13	0.01	0.05	0.01	0.31	0.19	0.45
LTE Band 4	M1		0.05	0.01	0.05	0.01	0.31	0.11	0.37
	M2		0.54	0.01	0.05	0.01	0.31	0.60	0.86
	M3		0.05	0.01	0.05	0.01	0.31	0.11	0.37
	M4		0.51	0.01	0.05	0.01	0.31	0.57	0.83
	M5		0.52	0.01	0.05	0.01	0.31	0.58	0.84
	M6		0.05	0.01	0.05	0.01	0.31	0.11	0.37
LTE Band 5	M1		0.06	0.01	0.05	0.01	0.31	0.12	0.38
	M2		0.37	0.01	0.05	0.01	0.31	0.43	0.69
	M3		0.07	0.01	0.05	0.01	0.31	0.13	0.39
	M4		0.37	0.01	0.05	0.01	0.31	0.43	0.69
	M5		0.39	0.01	0.05	0.01	0.31	0.45	0.71
	M6		0.07	0.01	0.05	0.01	0.31	0.13	0.39
LTE Band 7	M1		0.18	0.01	0.05	0.01	0.31	0.24	0.50
	M2		0.80	0.01	0.05	0.01	0.31	0.86	1.12
	M3		0.17	0.01	0.05	0.01	0.31	0.23	0.49
	M4		0.69	0.01	0.05	0.01	0.31	0.75	1.01
	M5		0.68	0.01	0.05	0.01	0.31	0.74	1.00
	M6		0.20	0.01	0.05	0.01	0.31	0.26	0.52
LTE Band 12	M1		0.21	0.01	0.05	0.01	0.31	0.27	0.53
	M2		0.30	0.01	0.05	0.01	0.31	0.36	0.62
	M3		0.20	0.01	0.05	0.01	0.31	0.26	0.52
	M4		0.26	0.01	0.05	0.01	0.31	0.32	0.58
	M5		0.27	0.01	0.05	0.01	0.31	0.33	0.59
	M6		0.22	0.01	0.05	0.01	0.31	0.28	0.54

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WWAN Band	Antenna	Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz Wi-Fi W1 1g SAR (W/kg)	3 2.4GHz Wi-Fi W2 1g SAR (W/kg)	4 5GHz Wi-Fi W1 1g SAR (W/kg)	5 5GHz Wi-Fi W2 1g SAR (W/kg)	**1+2+3 Summed 1g SAR (W/kg)**	**1+4+5 Summed 1g SAR (W/kg)**
LTE Band 13	M1	Back	0.06	0.01	0.05	0.01	0.31	0.12	0.38
	M2		0.28	0.01	0.05	0.01	0.31	0.34	0.60
	M3		0.06	0.01	0.05	0.01	0.31	0.12	0.38
	M4		0.26	0.01	0.05	0.01	0.31	0.32	0.58
	M5		0.25	0.01	0.05	0.01	0.31	0.31	0.57
	M6		0.06	0.01	0.05	0.01	0.31	0.12	0.38
LTE Band 14	M1		0.07	0.01	0.05	0.01	0.31	0.13	0.39
	M2		0.28	0.01	0.05	0.01	0.31	0.34	0.60
	M3		0.07	0.01	0.05	0.01	0.31	0.13	0.39
	M4		0.27	0.01	0.05	0.01	0.31	0.33	0.59
	M5		0.28	0.01	0.05	0.01	0.31	0.34	0.60
	M6		0.08	0.01	0.05	0.01	0.31	0.14	0.40
LTE Band 25	M1		0.14	0.01	0.05	0.01	0.31	0.20	0.46
	M2		0.55	0.01	0.05	0.01	0.31	0.61	0.87
	M3		0.13	0.01	0.05	0.01	0.31	0.19	0.45
	M4		0.53	0.01	0.05	0.01	0.31	0.59	0.85
	M5		0.54	0.01	0.05	0.01	0.31	0.60	0.86
	M6		0.14	0.01	0.05	0.01	0.31	0.20	0.46
LTE Band 26	M1		0.07	0.01	0.05	0.01	0.31	0.13	0.39
	M2		0.44	0.01	0.05	0.01	0.31	0.50	0.76
	M3		0.07	0.01	0.05	0.01	0.31	0.13	0.39
	M4		0.42	0.01	0.05	0.01	0.31	0.48	0.74
	M5		0.43	0.01	0.05	0.01	0.31	0.49	0.75
	M6		0.07	0.01	0.05	0.01	0.31	0.13	0.39
LTE Band 38	M1		0.02	0.01	0.05	0.01	0.31	0.08	0.34
	M2		0.46	0.01	0.05	0.01	0.31	0.52	0.78
	M3		0.02	0.01	0.05	0.01	0.31	0.08	0.34
	M4		0.45	0.01	0.05	0.01	0.31	0.51	0.77
	M5		0.46	0.01	0.05	0.01	0.31	0.52	0.78
	M6		0.02	0.01	0.05	0.01	0.31	0.08	0.34
LTE Band 41	M1		0.04	0.01	0.05	0.01	0.31	0.10	0.36
	M2		0.78	0.01	0.05	0.01	0.31	0.84	1.10
	M3		0.04	0.01	0.05	0.01	0.31	0.10	0.36
	M4		0.75	0.01	0.05	0.01	0.31	0.81	1.07
	M5		0.77	0.01	0.05	0.01	0.31	0.83	1.09
	M6		0.04	0.01	0.05	0.01	0.31	0.10	0.36
LTE Band 48	M1		0.16	0.01	0.05	0.01	0.31	0.22	0.48
	M2		0.71	0.01	0.05	0.01	0.31	0.77	1.03
	M3		0.17	0.01	0.05	0.01	0.31	0.23	0.49
	M4		0.69	0.01	0.05	0.01	0.31	0.75	1.01
	M5		0.69	0.01	0.05	0.01	0.31	0.75	1.01
	M6		0.18	0.01	0.05	0.01	0.31	0.24	0.50
LTE Band 66	M1		0.06	0.01	0.05	0.01	0.31	0.12	0.38
	M2		0.62	0.01	0.05	0.01	0.31	0.68	0.94
	M3		0.06	0.01	0.05	0.01	0.31	0.12	0.38
	M4		0.60	0.01	0.05	0.01	0.31	0.66	0.92
	M5		0.61	0.01	0.05	0.01	0.31	0.67	0.93
	M6		0.06	0.01	0.05	0.01	0.31	0.12	0.38

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WWAN Band	Antenna	Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz Wi-Fi W1 1g SAR (W/kg)	3 2.4GHz Wi-Fi W2 1g SAR (W/kg)	4 5GHz Wi-Fi W1 1g SAR (W/kg)	5 5GHz Wi-Fi W2 1g SAR (W/kg)	**1+2+3 Summed 1g SAR (W/kg)**	**1+4+5 Summed 1g SAR (W/kg)**
LTE Band 71	M1	Back	0.26	0.01	0.05	0.01	0.31	0.32	0.58
	M2		0.42	0.01	0.05	0.01	0.31	0.48	0.74
	M3		0.28	0.01	0.05	0.01	0.31	0.34	0.60
	M4		0.41	0.01	0.05	0.01	0.31	0.47	0.73
	M5		0.41	0.01	0.05	0.01	0.31	0.47	0.73
	M6		0.30	0.01	0.05	0.01	0.31	0.36	0.62
FR1 Band n2	M1		0.11	0.01	0.05	0.01	0.31	0.17	0.43
	M2		0.35	0.01	0.05	0.01	0.31	0.41	0.67
	M3		0.11	0.01	0.05	0.01	0.31	0.17	0.43
	M4		0.33	0.01	0.05	0.01	0.31	0.39	0.65
	M5		0.34	0.01	0.05	0.01	0.31	0.40	0.66
	M6		0.11	0.01	0.05	0.01	0.31	0.17	0.43
FR1 Band n5	M1		0.10	0.01	0.05	0.01	0.31	0.16	0.42
	M2		0.27	0.01	0.05	0.01	0.31	0.33	0.59
	M3		0.10	0.01	0.05	0.01	0.31	0.16	0.42
	M4		0.26	0.01	0.05	0.01	0.31	0.32	0.58
	M5		0.27	0.01	0.05	0.01	0.31	0.33	0.59
	M6		0.10	0.01	0.05	0.01	0.31	0.16	0.42
FR1 Band n7	M1		0.13	0.01	0.05	0.01	0.31	0.19	0.45
	M2		0.63	0.01	0.05	0.01	0.31	0.69	0.95
	M3		0.13	0.01	0.05	0.01	0.31	0.19	0.45
	M4		0.62	0.01	0.05	0.01	0.31	0.68	0.94
	M5		0.63	0.01	0.05	0.01	0.31	0.69	0.95
	M6		0.14	0.01	0.05	0.01	0.31	0.20	0.46
FR1 Band n12	M1		0.18	0.01	0.05	0.01	0.31	0.24	0.50
	M2		0.39	0.01	0.05	0.01	0.31	0.45	0.71
	M3		0.18	0.01	0.05	0.01	0.31	0.24	0.50
	M4		0.38	0.01	0.05	0.01	0.31	0.44	0.70
	M5		0.37	0.01	0.05	0.01	0.31	0.43	0.69
	M6		0.19	0.01	0.05	0.01	0.31	0.25	0.51
FR1 Band n25	M1		0.11	0.01	0.05	0.01	0.31	0.17	0.43
	M2		0.36	0.01	0.05	0.01	0.31	0.42	0.68
	M3		0.12	0.01	0.05	0.01	0.31	0.18	0.44
	M4		0.35	0.01	0.05	0.01	0.31	0.41	0.67
	M5		0.36	0.01	0.05	0.01	0.31	0.42	0.68
	M6		0.12	0.01	0.05	0.01	0.31	0.18	0.44
FR1 Band n38	M1		0.04	0.01	0.05	0.01	0.31	0.10	0.36
	M2		0.65	0.01	0.05	0.01	0.31	0.71	0.97
	M3		0.05	0.01	0.05	0.01	0.31	0.11	0.37
	M4		0.64	0.01	0.05	0.01	0.31	0.70	0.96
	M5		0.64	0.01	0.05	0.01	0.31	0.70	0.96
	M6		0.05	0.01	0.05	0.01	0.31	0.11	0.37
FR1 Band n48	M1		0.12	0.01	0.05	0.01	0.31	0.18	0.44
	M2		0.59	0.01	0.05	0.01	0.31	0.65	0.91
	M3		0.12	0.01	0.05	0.01	0.31	0.18	0.44
	M4		0.58	0.01	0.05	0.01	0.31	0.64	0.90
	M5		0.58	0.01	0.05	0.01	0.31	0.64	0.90
	M6		0.13	0.01	0.05	0.01	0.31	0.19	0.45

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WWAN Band	Antenna	Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz Wi-Fi W1 1g SAR (W/kg)	3 2.4GHz Wi-Fi W2 1g SAR (W/kg)	4 5GHz Wi-Fi W1 1g SAR (W/kg)	5 5GHz Wi-Fi W2 1g SAR (W/kg)	1+2+3 Summed 1g SAR (W/kg)	1+4+5 Summed 1g SAR (W/kg)
FR1 Band n66	M1	Back	0.06	0.01	0.05	0.01	0.31	0.12	0.38
	M2		0.67	0.01	0.05	0.01	0.31	0.73	0.99
	M3		0.06	0.01	0.05	0.01	0.31	0.12	0.38
	M4		0.61	0.01	0.05	0.01	0.31	0.67	0.93
	M5		0.66	0.01	0.05	0.01	0.31	0.72	0.98
	M6		0.06	0.01	0.05	0.01	0.31	0.12	0.38
FR1 Band n71	M1		0.11	0.01	0.05	0.01	0.31	0.17	0.43
	M2		0.38	0.01	0.05	0.01	0.31	0.44	0.70
	M3		0.11	0.01	0.05	0.01	0.31	0.17	0.43
	M4		0.37	0.01	0.05	0.01	0.31	0.43	0.69
	M5		0.37	0.01	0.05	0.01	0.31	0.43	0.69
	M6		0.11	0.01	0.05	0.01	0.31	0.17	0.43
FR1 Band n77	M1		0.10	0.01	0.05	0.01	0.31	0.16	0.42
	M2		0.58	0.01	0.05	0.01	0.31	0.64	0.90
	M3		0.10	0.01	0.05	0.01	0.31	0.16	0.42
	M4		0.57	0.01	0.05	0.01	0.31	0.63	0.89
	M5		0.29	0.01	0.05	0.01	0.31	0.35	0.61
	M6		0.05	0.01	0.05	0.01	0.31	0.11	0.37

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The worst case summation is WCDMA Band 2 with 5 GHz WiFi (MIMO). The value is 1.22 W/kg which is below the limit. Therefore, the simultaneous evaluation is excluded..

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LTE UL CA	Antenna	Exposure Position	1	2	3	4	5	6	1+2+3+4 Summed 1g SAR (W/kg)	1+2+5+6 Summed 1g SAR (W/kg)
			1^{ST} UL	2^{nd} UL	2.4GHz Wi-Fi W1	2.4GHz Wi-Fi W2	5GHz Wi-Fi W1	5GHz Wi-Fi W2		
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)		
12A-4A	M1	Back	0.21	0.05	0.01	0.05	0.01	0.31	0.32	0.58
	M2		0.30	0.54	0.01	0.05	0.01	0.31	0.90	1.16
	M3		0.20	0.05	0.01	0.05	0.01	0.31	0.31	0.57
	M4		0.26	0.51	0.01	0.05	0.01	0.31	0.83	1.09
	M5		0.27	0.52	0.01	0.05	0.01	0.31	0.85	1.11
	M6		0.22	0.05	0.01	0.05	0.01	0.31	0.33	0.59
12A-2A	M1		0.21	0.13	0.01	0.05	0.01	0.31	0.40	0.66
	M2		0.30	0.51	0.01	0.05	0.01	0.31	0.87	1.13
	M3		0.20	0.13	0.01	0.05	0.01	0.31	0.39	0.65
	M4		0.26	0.50	0.01	0.05	0.01	0.31	0.82	1.08
	M5		0.27	0.51	0.01	0.05	0.01	0.31	0.84	1.10
	M6		0.22	0.13	0.01	0.05	0.01	0.31	0.41	0.67
13A-2A	M1		0.06	0.13	0.01	0.05	0.01	0.31	0.25	0.51
	M2		0.28	0.51	0.01	0.05	0.01	0.31	0.85	1.11
	M3		0.06	0.13	0.01	0.05	0.01	0.31	0.25	0.51
	M4		0.26	0.50	0.01	0.05	0.01	0.31	0.82	1.08
	M5		0.25	0.51	0.01	0.05	0.01	0.31	0.82	1.08
	M6		0.06	0.13	0.01	0.05	0.01	0.31	0.25	0.51
13A-4A	M1		0.06	0.05	0.01	0.05	0.01	0.31	0.17	0.43
	M2		0.28	0.54	0.01	0.05	0.01	0.31	0.88	1.14
	M3		0.06	0.05	0.01	0.05	0.01	0.31	0.17	0.43
	M4		0.26	0.51	0.01	0.05	0.01	0.31	0.83	1.09
	M5		0.25	0.52	0.01	0.05	0.01	0.31	0.83	1.09
	M6		0.06	0.05	0.01	0.05	0.01	0.31	0.17	0.43
5A-2A	M1		0.06	0.13	0.01	0.05	0.01	0.31	0.25	0.51
	M2		0.37	0.51	0.01	0.05	0.01	0.31	0.94	1.20
	M3		0.07	0.13	0.01	0.05	0.01	0.31	0.26	0.52
	M4		0.37	0.50	0.01	0.05	0.01	0.31	0.93	1.19
	M5		0.39	0.51	0.01	0.05	0.01	0.31	0.96	1.22
	M6		0.07	0.13	0.01	0.05	0.01	0.31	0.26	0.52
5A-4A	M1		0.06	0.05	0.01	0.05	0.01	0.31	0.17	0.43
	M2		0.37	0.54	0.01	0.05	0.01	0.31	0.97	1.23
	M3		0.07	0.05	0.01	0.05	0.01	0.31	0.18	0.44
	M4		0.37	0.51	0.01	0.05	0.01	0.31	0.94	1.20
	M5		0.39	0.52	0.01	0.05	0.01	0.31	0.97	1.23
	M6		0.07	0.05	0.01	0.05	0.01	0.31	0.18	0.44
66A-2A	M1		0.06	0.13	0.01	0.05	0.01	0.31	0.25	0.51
	M2		0.62	0.51	0.01	0.05	0.01	0.31	1.19	1.45
	M3		0.06	0.13	0.01	0.05	0.01	0.31	0.25	0.51
	M4		0.60	0.50	0.01	0.05	0.01	0.31	1.16	1.42
	M5		0.61	0.51	0.01	0.05	0.01	0.31	1.18	1.44
	M6		0.06	0.13	0.01	0.05	0.01	0.31	0.25	0.51
66A-5A	M1		0.06	0.06	0.01	0.05	0.01	0.31	0.18	0.44
	M2		0.62	0.37	0.01	0.05	0.01	0.31	1.05	1.31
	M3		0.06	0.07	0.01	0.05	0.01	0.31	0.19	0.45
	M4		0.60	0.37	0.01	0.05	0.01	0.31	1.03	1.29
	M5		0.61	0.39	0.01	0.05	0.01	0.31	1.06	1.32
	M6		0.06	0.07	0.01	0.05	0.01	0.31	0.19	0.45
7A-5A	M1		0.18	0.06	0.01	0.05	0.01	0.31	0.30	0.56
	M2		0.80	0.37	0.01	0.05	0.01	0.31	1.23	1.49
	M3		0.17	0.07	0.01	0.05	0.01	0.31	0.30	0.56
	M4		0.69	0.37	0.01	0.05	0.01	0.31	1.12	1.38
	M5		0.68	0.39	0.01	0.05	0.01	0.31	1.13	1.39
	M6		0.20	0.07	0.01	0.05	0.01	0.31	0.33	0.59

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LTE UL CA	Antenna	Exposure Position	1 1ST UL 1g SAR (W/kg)	2 2nd UL 1g SAR (W/kg)	3 2.4GHz Wi-Fi W1 1g SAR (W/kg)	4 2.4GHz Wi-Fi W2 1g SAR (W/kg)	5 5GHz Wi-Fi W1 1g SAR (W/kg)	6 5GHz Wi-Fi W2 1g SAR (W/kg)	**1+2+3+4 Summed 1g SAR (W/kg)**	**1+2+5+6 Summed 1g SAR (W/kg)**
12A-n66A	M1	Back	0.21	0.06	0.01	0.05	0.01	0.31	0.33	0.59
	M2		0.30	0.67	0.01	0.05	0.01	0.31	1.03	1.29
	M3		0.20	0.06	0.01	0.05	0.01	0.31	0.32	0.58
	M4		0.26	0.61	0.01	0.05	0.01	0.31	0.93	1.19
	M5		0.27	0.66	0.01	0.05	0.01	0.31	0.99	1.25
	M6		0.22	0.06	0.01	0.05	0.01	0.31	0.34	0.60
12A-n2A	M1		0.21	0.11	0.01	0.05	0.01	0.31	0.38	0.64
	M2		0.30	0.35	0.01	0.05	0.01	0.31	0.71	0.97
	M3		0.20	0.11	0.01	0.05	0.01	0.31	0.37	0.63
	M4		0.26	0.33	0.01	0.05	0.01	0.31	0.65	0.91
	M5		0.27	0.34	0.01	0.05	0.01	0.31	0.67	0.93
	M6		0.22	0.11	0.01	0.05	0.01	0.31	0.39	0.65
13A-n66A	M1		0.06	0.06	0.01	0.05	0.01	0.31	0.18	0.44
	M2		0.28	0.67	0.01	0.05	0.01	0.31	1.01	1.27
	M3		0.06	0.06	0.01	0.05	0.01	0.31	0.18	0.44
	M4		0.26	0.61	0.01	0.05	0.01	0.31	0.93	1.19
	M5		0.25	0.66	0.01	0.05	0.01	0.31	0.97	1.23
	M6		0.06	0.06	0.01	0.05	0.01	0.31	0.18	0.44
13A-n2A	M1		0.06	0.11	0.01	0.05	0.01	0.31	0.23	0.49
	M2		0.28	0.35	0.01	0.05	0.01	0.31	0.69	0.95
	M3		0.06	0.11	0.01	0.05	0.01	0.31	0.23	0.49
	M4		0.26	0.33	0.01	0.05	0.01	0.31	0.65	0.91
	M5		0.25	0.34	0.01	0.05	0.01	0.31	0.65	0.91
	M6		0.06	0.11	0.01	0.05	0.01	0.31	0.23	0.49
2A-n5A	M1		0.13	0.10	0.01	0.05	0.01	0.31	0.29	0.55
	M2		0.51	0.27	0.01	0.05	0.01	0.31	0.84	1.10
	M3		0.13	0.10	0.01	0.05	0.01	0.31	0.29	0.55
	M4		0.50	0.26	0.01	0.05	0.01	0.31	0.82	1.08
	M5		0.51	0.27	0.01	0.05	0.01	0.31	0.84	1.10
	M6		0.13	0.10	0.01	0.05	0.01	0.31	0.29	0.55
2A-n71A	M1		0.13	0.11	0.01	0.05	0.01	0.31	0.30	0.56
	M2		0.51	0.38	0.01	0.05	0.01	0.31	0.95	1.21
	M3		0.13	0.11	0.01	0.05	0.01	0.31	0.30	0.56
	M4		0.50	0.37	0.01	0.05	0.01	0.31	0.93	1.19
	M5		0.51	0.37	0.01	0.05	0.01	0.31	0.94	1.20
	M6		0.13	0.11	0.01	0.05	0.01	0.31	0.30	0.56
5A-n66A	M1		0.06	0.06	0.01	0.05	0.01	0.31	0.18	0.44
	M2		0.37	0.67	0.01	0.05	0.01	0.31	1.10	1.36
	M3		0.07	0.06	0.01	0.05	0.01	0.31	0.19	0.45
	M4		0.37	0.61	0.01	0.05	0.01	0.31	1.04	1.30
	M5		0.39	0.66	0.01	0.05	0.01	0.31	1.11	1.37
	M6		0.07	0.06	0.01	0.05	0.01	0.31	0.19	0.45
5A-n2A	M1		0.06	0.11	0.01	0.05	0.01	0.31	0.23	0.49
	M2		0.37	0.35	0.01	0.05	0.01	0.31	0.78	1.04
	M3		0.07	0.11	0.01	0.05	0.01	0.31	0.24	0.50
	M4		0.37	0.33	0.01	0.05	0.01	0.31	0.76	1.02
	M5		0.39	0.34	0.01	0.05	0.01	0.31	0.79	1.05
	M6		0.07	0.11	0.01	0.05	0.01	0.31	0.24	0.50
66A-n5A	M1		0.06	0.10	0.01	0.05	0.01	0.31	0.22	0.48
	M2		0.62	0.27	0.01	0.05	0.01	0.31	0.95	1.21
	M3		0.06	0.10	0.01	0.05	0.01	0.31	0.22	0.48
	M4		0.60	0.26	0.01	0.05	0.01	0.31	0.92	1.18
	M5		0.61	0.27	0.01	0.05	0.01	0.31	0.94	1.20
	M6		0.06	0.10	0.01	0.05	0.01	0.31	0.22	0.48

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LTE UL CA	Antenna	Exposure Position	1 1ST UL 1g SAR (W/kg)	2 2nd UL 1g SAR (W/kg)	3 2.4GHz Wi-Fi W1 1g SAR (W/kg)	4 2.4GHz Wi-Fi W2 1g SAR (W/kg)	5 5GHz Wi-Fi W1 1g SAR (W/kg)	6 5GHz Wi-Fi W2 1g SAR (W/kg)	1+2+3+4 Summed 1g SAR (W/kg)	1+2+5+6 Summed 1g SAR (W/kg)
66A-n71A	M1	Back	0.06	0.11	0.01	0.05	0.01	0.31	0.23	0.49
	M2		0.62	0.38	0.01	0.05	0.01	0.31	1.06	1.32
	M3		0.06	0.11	0.01	0.05	0.01	0.31	0.23	0.49
	M4		0.60	0.37	0.01	0.05	0.01	0.31	1.03	1.29
	M5		0.61	0.37	0.01	0.05	0.01	0.31	1.04	1.30
	M6		0.06	0.11	0.01	0.05	0.01	0.31	0.23	0.49
7A-n5A	M1		0.18	0.10	0.01	0.05	0.01	0.31	0.34	0.60
	M2		0.80	0.27	0.01	0.05	0.01	0.31	1.13	1.39
	M3		0.17	0.10	0.01	0.05	0.01	0.31	0.33	0.59
	M4		0.69	0.26	0.01	0.05	0.01	0.31	1.01	1.27
	M5		0.68	0.27	0.01	0.05	0.01	0.31	1.01	1.27
	M6		0.20	0.10	0.01	0.05	0.01	0.31	0.36	0.62
7A-n71A	M1		0.18	0.11	0.01	0.05	0.01	0.31	0.35	0.61
	M2		0.80	0.38	0.01	0.05	0.01	0.31	1.24	1.50
	M3		0.17	0.11	0.01	0.05	0.01	0.31	0.34	0.60
	M4		0.69	0.37	0.01	0.05	0.01	0.31	1.12	1.38
	M5		0.68	0.37	0.01	0.05	0.01	0.31	1.11	1.37
	M6		0.20	0.11	0.01	0.05	0.01	0.31	0.37	0.63

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The worst case summation is LTE Band 7 and FR1 band n71 with 5 GHz WiFi (MIMO). The value is 1.50 W/kg which is below the limit. Therefore, the simultaneous evaluation is excluded.

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11. Test Equipment List

Table 11.1 Equipment Specifications

Type	Calibration Due Date	Calibration Done Date	Serial Number
Staubli Robot TX60L	N/A	N/A	F07/55M6A1/A/01
Measurement Controller CS8c	N/A	N/A	1012
ELI5 Flat Phantom	N/A	N/A	2037
Device Holder	N/A	N/A	N/A
Data Acquisition Electronics 4	04/19/2024	04/19/2023	1416
SPEAG E-Field Probe EX3DV4	01/17/2024	01/17/2023	7530
Speag Validation Dipole D750V2	06/04/2024	06/04/2021	1053
Speag Validation Dipole D900V2	06/04/2024	06/04/2021	1d128
Speag Validation Dipole D1750V2	06/03/2024	06/03/2021	1061
Speag Validation Dipole D1900V2	06/04/2024	06/04/2021	5d147
Speag Validation Dipole D2550V2	06/03/2024	06/03/2021	1003
Speag Validation Dipole D3700V2	04/13/2024	04/13/2021	1024
Agilent N1911A Power Meter	03/14/2024	03/14/2023	GB45100254
Agilent N1922A Power Sensor	03/13/2024	03/13/2023	MY45240464
Agilent (HP) 8596E Spectrum Analyzer	03/13/2024	03/13/2023	3826A01468
Agilent (HP) 83752A Synthesized Sweeper	03/14/2024	03/14/2023	3610A01048
Agilent (HP) 8753C Vector Network Analyzer	03/14/2024	03/14/2023	3135A01724
Agilent (HP) 85047A S-Parameter Test Set	03/14/2024	03/14/2023	2904A00595
Copper Mountain R140 Vector Reflectometer	03/13/2024	03/13/2023	21390004
Anritsu MT8820C	N/A	N/A	6201381721
Aprel Dielectric Probe Assembly	N/A	N/A	0011
Head Equivalent Matter (750 MHz)	N/A	N/A	N/A
Head Equivalent Matter (900 MHz)	N/A	N/A	N/A
Head Equivalent Matter (1750 MHz)	N/A	N/A	N/A
Head Equivalent Matter (1900 MHz)	N/A	N/A	N/A
Head Equivalent Matter (2550 MHz)	N/A	N/A	N/A
Head Equivalent Matter (3-6 GHz)	N/A	N/A	N/A

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12. Conclusion

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the FCC/IC. These measurements are taken to simulate the RF effects exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The tested device complies with the requirements in respect to all parameters subject to the test. The test results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body is a very complex phenomena that depends on the mass, shape, and size of the body; the orientation of the body with respect to the field vectors; and, the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because innumerable factors may interact to determine the specific biological outcome of an exposure to electromagnetic fields, any protection guide shall consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

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13. References

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radio Frequency Radiation, August 1996

[2] ANSI/IEEE C95.1 – 1992, American National Standard Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300kHz to 100GHz, New York: IEEE, 1992.

[3] ANSI/IEEE C95.3 – 1992, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave, New York: IEEE, 1992.

[4] International Electrotechnical Commission, IEC 62209-2 (Edition 1.0), Human Exposure to radio frequency fields from hand-held and body mounted wireless communication devices – Human models, instrumentation, and procedures – Part 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.

[5] IEEE Standard 1528 – 2013, IEEE Recommended Practice for Determining the Peak-Spatial Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communication Devices: Measurement Techniques, June 2013.

[6] Industry Canada, RSS – 102 Issue 5, Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), March 2015.

[7] Health Canada, Safety Code 6, Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3kHz to 300 GHz, 2009.

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Appendix A – System Validation Plots and Data

****
Test Result for UIM Dielectric Parameter
Mon 11/Sep/2023
Freq Frequency(GHz)
FCC_eH Limits for Head Epsilon
FCC_sH Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM
****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.6500	42.46	0.88	41.49	0.86
0.6600	42.41	0.88	41.43	0.87
0.6700	42.36	0.89	41.37	0.87
0.6800	42.31	0.89	41.31	0.87
0.6805	42.307	0.89	41.307	0.871*
0.6900	42.25	0.89	41.25	0.88
0.7000	42.20	0.89	41.19	0.88
0.7075	42.163	0.89	41.138	0.888*
0.7100	42.15	0.89	41.12	0.89
0.7200	42.10	0.89	41.07	0.90
0.7300	42.05	0.89	41.00	0.91
0.7400	41.99	0.89	40.94	0.91
0.7500	41.94	0.89	40.89	0.92
0.7600	41.89	0.89	40.83	0.93
0.7700	41.84	0.89	40.77	0.94
0.7800	41.79	0.90	40.71	0.94
0.7900	41.73	0.90	40.65	0.95
0.8000	41.68	0.90	40.61	0.95

* value interpolated

****
Test Result for UIM Dielectric Parameter
Mon 11/Sep/2023
Freq Frequency(GHz)
eH Limits for Head Epsilon
sH Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM
****

Freq	eH	sH	Test_e	Test_s
0.8000	41.68	0.90	41.04	0.91
0.8100	41.63	0.90	40.99	0.92
0.8200	41.58	0.90	40.93	0.93
0.8300	41.53	0.90	40.98	0.93
0.8365	41.511	0.907	40.961	0.937*
0.8400	41.50	0.91	40.95	0.94
0.8500	41.50	0.92	40.93	0.95
0.8600	41.50	0.93	40.91	0.96
0.8700	41.50	0.94	40.89	0.97
0.8800	41.50	0.95	40.88	0.98
0.8900	41.50	0.96	40.87	0.99
0.8975	41.50	0.968	40.863	0.998*
0.9000	41.50	0.97	40.86	1.00
0.9100	41.50	0.98	40.85	1.01
0.9200	41.49	0.98	40.84	1.01

* value interpolated

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****
Test Result for UIM Dielectric Parameter
Tue 12/Sep/2023
Freq Frequency(GHz)
eH Limits for Head Epsilon
sH Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM
****

Freq	eH	sH	Test_e	Test_s
1.7000	40.16	1.34	39.49	1.35
1.7100	40.14	1.35	39.47	1.36
1.7200	40.13	1.35	39.45	1.37
1.7300	40.11	1.36	39.43	1.37
1.7400	40.09	1.37	39.41	1.38
1.7450	40.085	1.37	39.40	1.385*
1.7475	40.083	1.37	39.395	1.388*
1.7500	40.08	1.37	39.39	1.39
1.7600	40.06	1.38	39.37	1.40
1.7700	40.05	1.38	39.35	1.41
1.7800	40.03	1.39	39.33	1.41
1.7900	40.02	1.39	39.31	1.42

* value interpolated

****
Test Result for UIM Dielectric Parameter
Wed 13/Sep/2023
Freq Frequency(GHz)
eH Limits for Head Epsilon
sH Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM
****

Freq	eH	sH	Test_e	Test_s
1.8500	40.00	1.40	39.75	1.40
1.8600	40.00	1.40	39.73	1.41
1.8700	40.00	1.40	39.71	1.41
1.8800	40.00	1.40	39.69	1.42
1.8825	40.00	1.40	39.685	1.42*
1.8900	40.00	1.40	39.67	1.42
1.9000	40.00	1.40	39.65	1.42
1.9100	40.00	1.40	39.63	1.43
1.9200	40.00	1.40	39.62	1.44
1.9300	40.00	1.40	39.60	1.44
1.9400	40.00	1.40	39.59	1.44
1.9500	40.00	1.40	39.58	1.44
1.9600	40.00	1.40	39.57	1.45
1.9700	40.00	1.40	39.55	1.45
1.9800	40.00	1.40	39.54	1.45
1.9900	40.00	1.40	39.53	1.46

* value interpolated

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****
Test Result for UIM Dielectric Parameter
Wed 13/Sep/2023
Freq Frequency(GHz)
FCC_eH Limits for Head Epsilon
FCC_sH Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM
****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
2.4900	39.15	1.84	38.83	1.85
2.5000	39.14	1.85	38.81	1.86
2.5100	39.12	1.87	38.78	1.87
2.5200	39.11	1.88	38.76	1.89
2.5300	39.10	1.89	38.74	1.90
2.5350	39.095	1.895	38.725	1.905*
2.5400	39.09	1.90	38.71	1.91
2.5500	39.075	1.91	38.69	1.925*
2.5600	39.06	1.92	38.67	1.94
2.5700	39.05	1.93	38.64	1.95
2.5800	39.03	1.94	38.62	1.97
2.5900	39.02	1.95	38.59	1.98
2.5950	39.015	1.955	38.595	1.98*
2.6000	39.01	1.96	38.60	1.98
2.6100	39.00	1.97	38.58	1.99
2.6200	38.98	1.99	38.57	2.00
2.6300	38.97	2.00	38.55	2.01

* value interpolated

****
Test Result for UIM Dielectric Parameter
Thu 14/Sep/2023
Freq Frequency(GHz)
FCC_eH Limits for Head Epsilon
FCC_sH Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM
****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
3.4800	37.95	2.89	37.32	2.88
3.5000	37.93	2.91	37.28	2.90
3.5200	37.91	2.93	37.26	2.92
3.5400	37.90	2.93	37.22	2.94
3.5500	37.88	2.95	37.20	2.96*
3.5600	37.86	2.97	37.18	2.98
3.5800	37.84	2.99	37.16	3.00
3.6000	37.81	3.02	37.13	3.03
3.6200	37.79	3.04	37.11	3.05
3.6250	37.785	3.045	37.105	3.055*
3.6400	37.77	3.06	37.09	3.07
3.6600	37.75	3.08	37.07	3.09
3.6800	37.72	3.10	37.04	3.11
3.7000	37.70	3.12	37.02	3.13
3.7200	37.68	3.14	37.00	3.15
3.7400	37.65	3.17	36.97	3.18
3.7500	37.64	3.18	36.96	3.19*
3.7600	37.63	3.19	36.95	3.20
3.7800	37.61	3.21	36.93	3.22
3.8000	37.58	3.23	36.90	3.24

* value interpolated

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Plot 1

DUT: Dipole 750 MHz D750V3; Type: D750V3; Serial: D750V3 - SN 1053

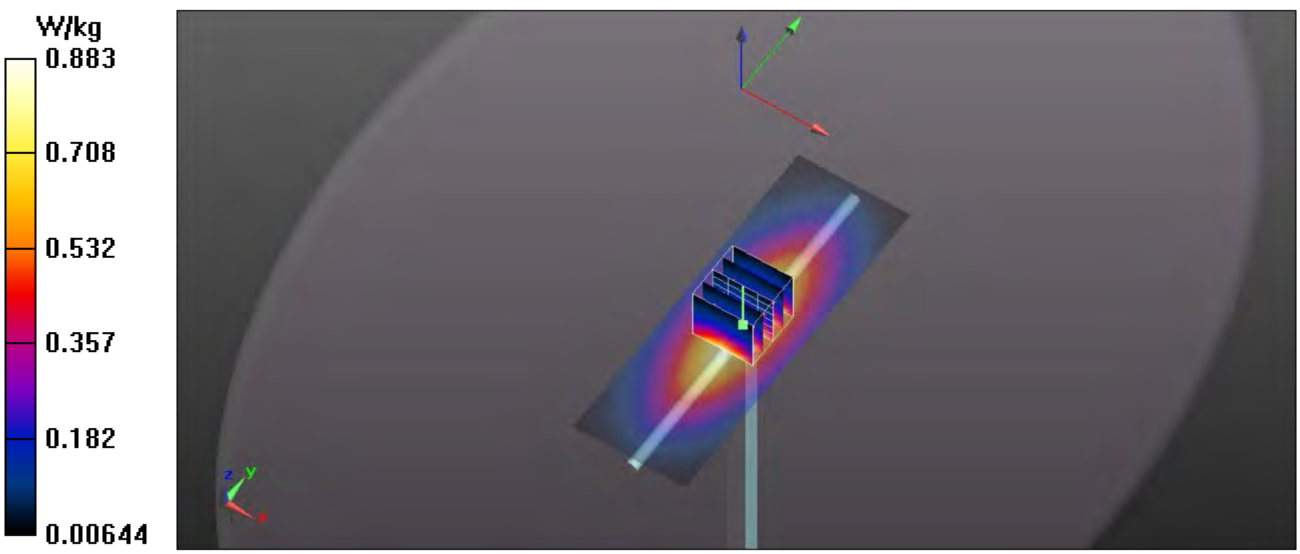
Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: HSL750; Medium parameters used (interpolated): f = 750 MHz; σ = 0.92 S/m; ε_r = 40.89; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 9/11/2023; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 – SN7530; ConvF(9.62, 9.26, 10.37); Calibrated: 1/17/2023;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/19/2023
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

750 MHz Head/Verification/Area Scan (41x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.889 W/kg

750 MHz Head/Verification /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 31.369 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.562 mW/g
P_{in}= 100 mW
SAR(1 g) = 0.856 mW/g; SAR(10 g) = 0.559 mW/g
Maximum value of SAR (measured) = 0.884 W/kg



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RF Exposure Lab

Plot 2

DUT: Dipole 900 MHz D900V2; Type: D900V2; Serial: D900V2 - SN:1d128

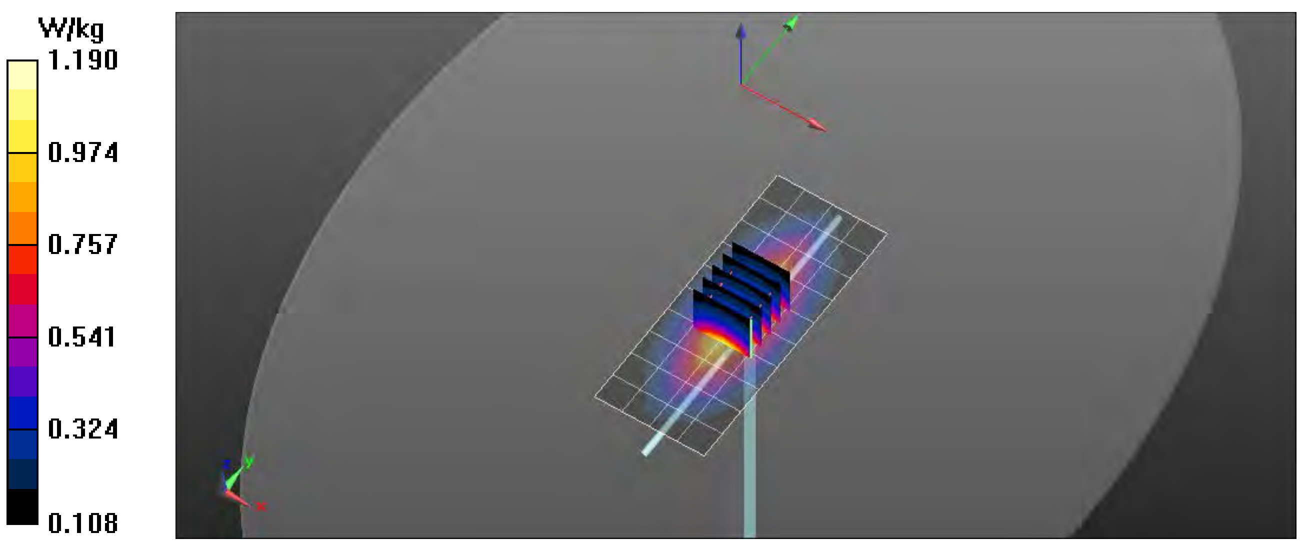
Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: HSL900; Medium parameters used: f = 900 MHz; σ = 1 S/m; ε_r = 40.86; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 9/11/2023; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN7530; ConvF(9.5, 9.25, 9.3); Calibrated: 1/17/2023;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/19/2023
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

900 MHz Head/Verification/Area Scan (5x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.22 W/kg

900 MHz Head/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 31.897 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.46 W/kg
P_{in}= 100 mW
SAR(1 g) = 1.17 W/kg; SAR(10 g) = 0.715 W/kg
Maximum value of SAR (measured) = 1.19 W/kg



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Plot 3

DUT: Dipole 1750 MHz D1750V2; Type: D1750V2; Serial: D1750V2 - SN:1061

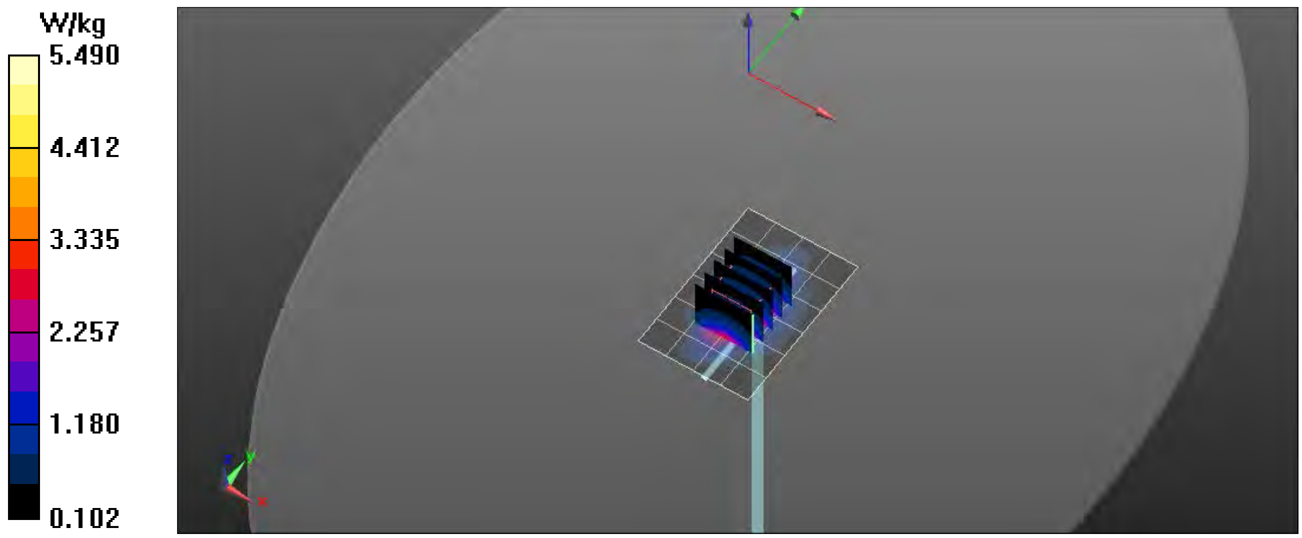
Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: HSL1750; Medium parameters used: f = 1750 MHz; σ = 1.39 S/m; ε_r = 39.39; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 9/12/2023; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN7530; ConvF(8.28, 8.22, 8.47); Calibrated: 1/17/2023;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/19/2023
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

1750 MHz Head/Verification/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.22 W/kg

1750 MHz Head/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.387 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 6.84 W/kg
P_{in}= 100 mW
SAR(1 g) = 3.77 W/kg; SAR(10 g) = 1.96 W/kg
Maximum value of SAR (measured) = 5.49 W/kg



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Plot 4

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN: 5d147

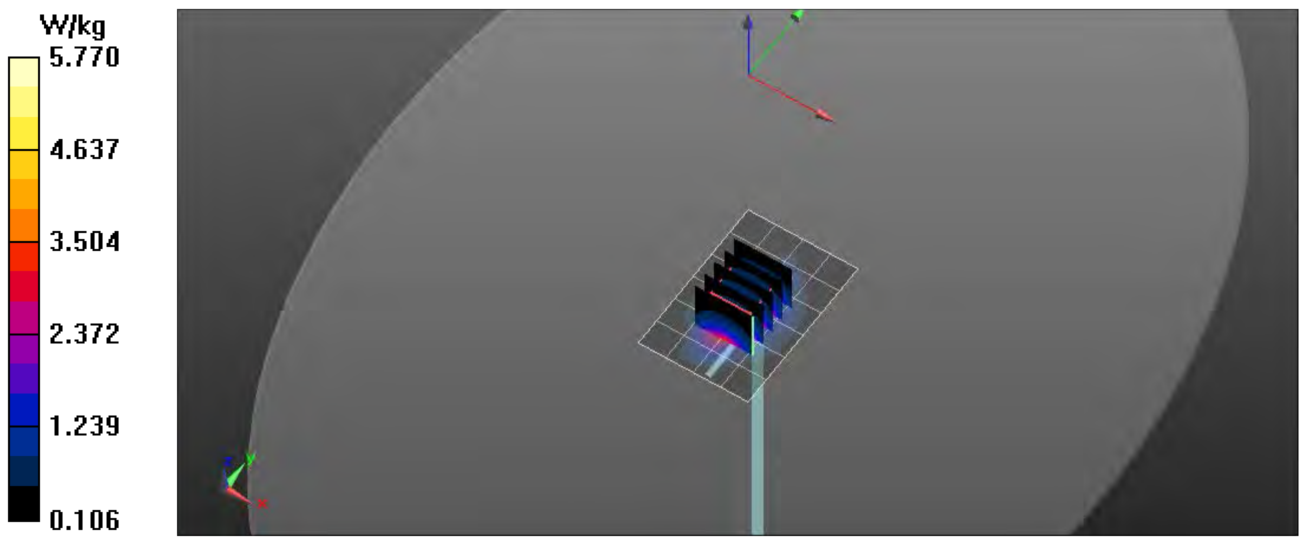
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL1900; Medium parameters used: f = 1900 MHz; σ = 1.42 S/m; ε_r = 39.65; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 9/13/2023; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN7530; ConvF(8.14, 8.08, 8.31); Calibrated: 1/17/2023;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/19/2023
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

1900 MHz Head/Verification/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.55 W/kg

1900 MHz Head/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 32.965 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 7.22 W/kg
P_{in}= 100 mW
SAR(1 g) = 4.17 W/kg; SAR(10 g) = 2.17 W/kg
Maximum value of SAR (measured) = 5.77 W/kg



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Plot 5

DUT: Dipole 2550 MHz D2550V2; Type: D2550V2; Serial: D2550V2 - SN:1003

Communication System: CW; Frequency: 2550 MHz; Duty Cycle: 1:1
Medium: HSL2550; Medium parameters used (interpolated): f = 2550 MHz; σ = 1.925 S/m; ε_r = 38.69; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 9/13/2023; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN7530; ConvF(7.54, 7.33, 7.61); Calibrated: 1/17/2023;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/19/2023
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

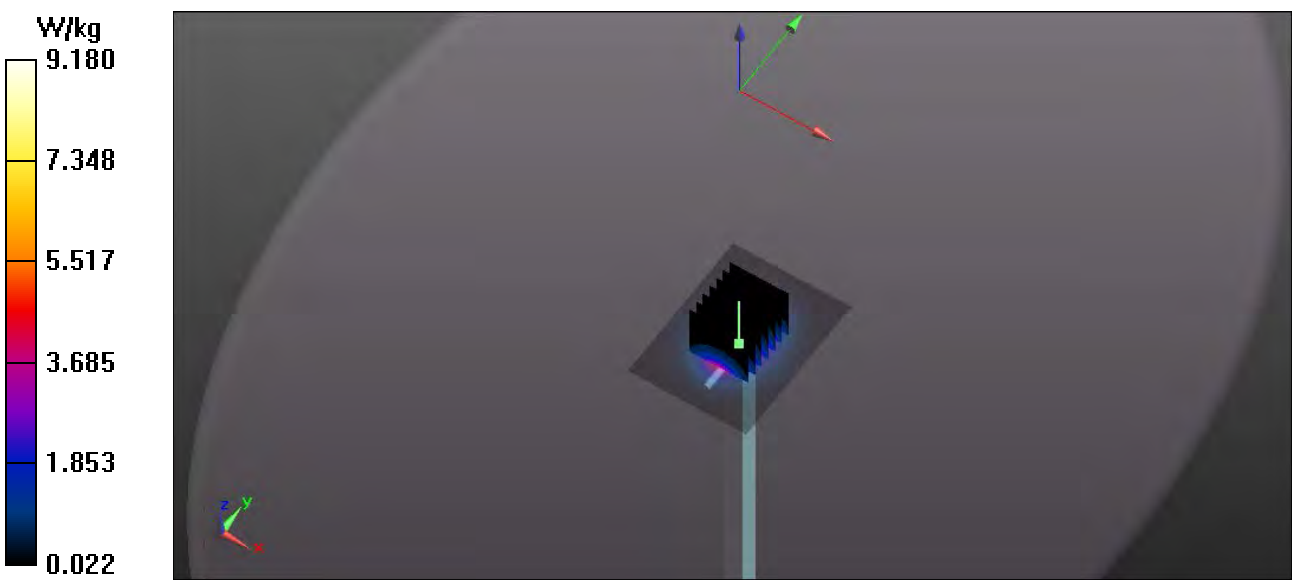
Procedure Notes:

2550 MHz Head/Verification/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 9.21 W/kg

2550 MHz Head/Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.694 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 11.6 W/kg
P_{in}= 100 mW
SAR(1 g) = 5.66 W/kg; SAR(10 g) = 2.49 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 9.15 W/kg



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Plot 6

DUT: Dipole D3700V2; Type: D3700V2; Serial: D3700V2 - SN:1024

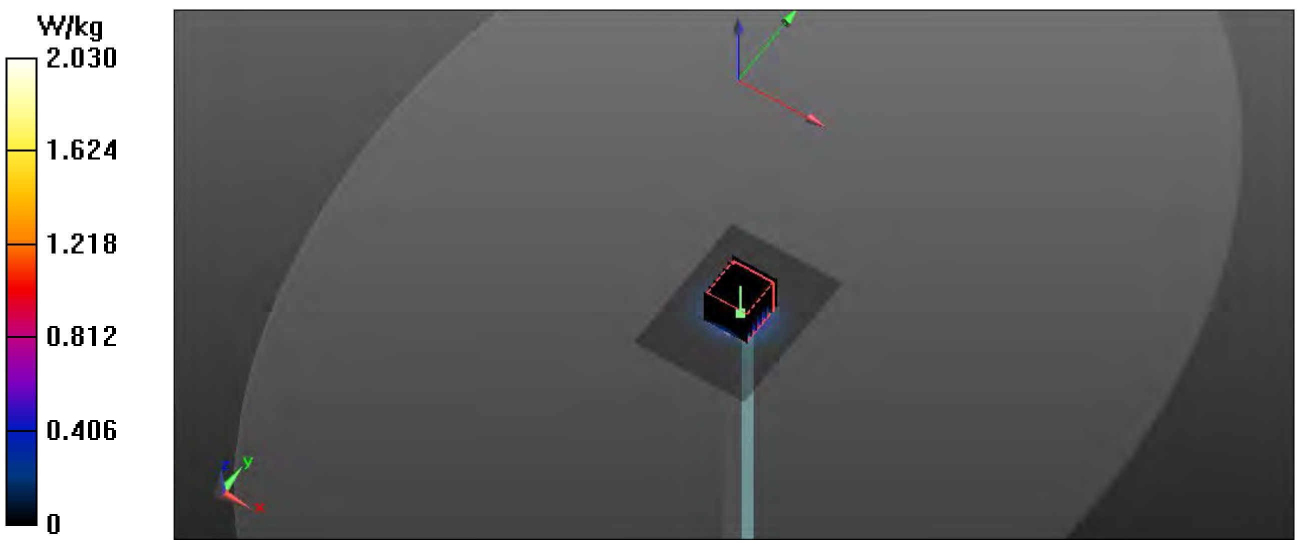
Communication System: CW; Frequency: 3700 MHz; Duty Cycle: 1:1
Medium: HSL 3-6 GHz; Medium parameters used: f = 3700 MHz; σ = 3.13 S/m; ε_r = 37.02; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 9/14/2023; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 – SN7530; ConvF(6.51, 6.52, 6.65); Calibrated: 1/17/2023;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/19/2023
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

3700 MHz Head/Verification/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.01 W/kg

3700 MHz Head/Verification/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 13.367 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.35 W/kg
P_{in}= 10 mW
SAR(1 g) = 0.695 W/kg; SAR(10 g) = 0.249 W/kg
Maximum value of SAR (measured) = 2.02 W/kg



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Appendix B – SAR Test Data Plots

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RF Exposure Lab

Plot 1

DUT: PRO460; Type: Wireless TV Video Case; Serial: AVWPRO40523008993

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: HSL900; Medium parameters used (interpolated): f = 836.5 MHz; σ = 0.937 S/m; ε_r = 40.961; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 9/11/2023; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7530; ConvF(9.5, 9.25, 9.3); Calibrated: 1/17/2023
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/19/2023
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

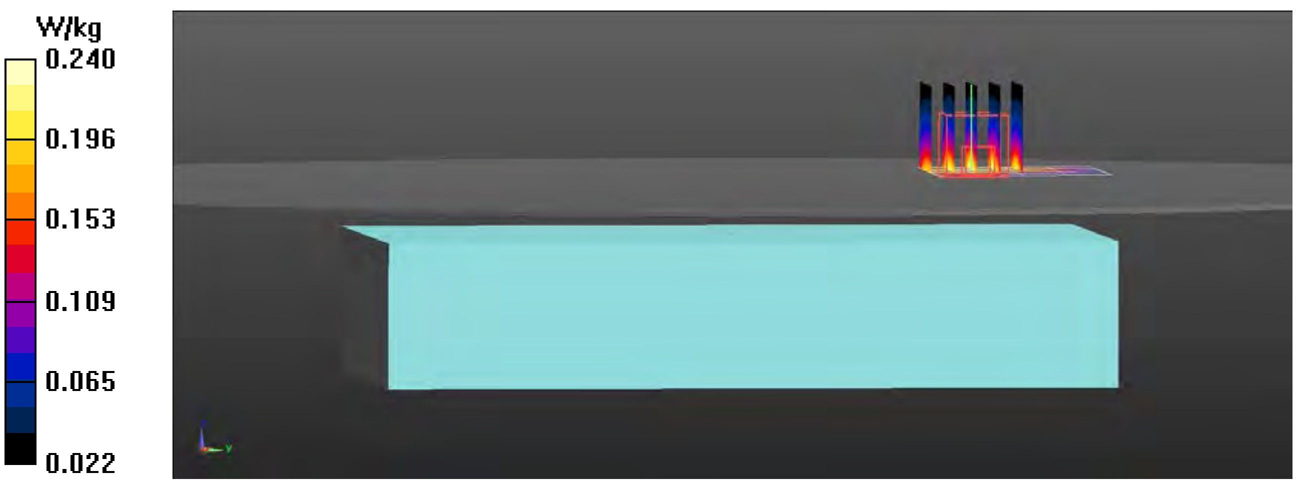
Procedure Notes:

n5 LTE/Ant M2 Mid 1 RB 49 Offset/Area Scan (5x5x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.242 W/kg

n5 LTE/Ant M2 Mid 1 RB 49 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.569 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.276 W/kg
SAR(1 g) = 0.196 W/kg; SAR(10 g) = 0.131 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.240 W/kg



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RF Exposure Lab

Plot 2

DUT: PRO460; Type: Wireless TV Video Case; Serial: AVWPRO40523008993

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 2535 MHz; Duty Cycle: 1:1
Medium: HSL2550; Medium parameters used (interpolated): f = 2535 MHz; σ = 1.905 S/m; ε_r = 38.725; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 9/13/2023; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7530; ConvF(7.54, 7.33, 7.61); Calibrated: 1/17/2023
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/19/2023
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

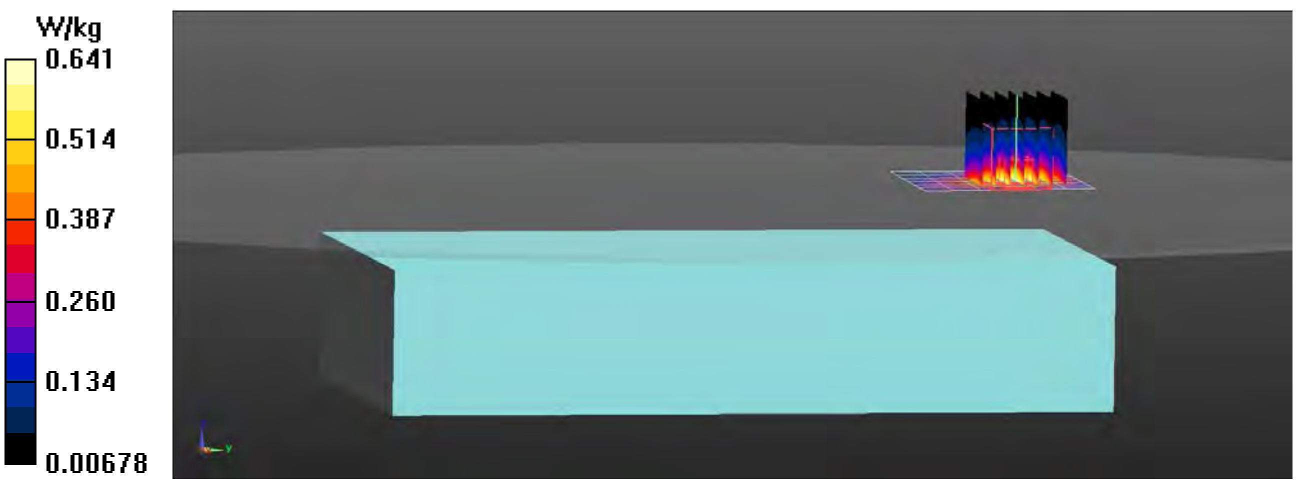
Procedure Notes:

n7 LTE/Ant M2 Mid 1 RB 49 Offset/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.637 W/kg

n7 LTE/Ant M2 Mid 1 RB 49 Offset/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.406 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.806 W/kg
SAR(1 g) = 0.475 W/kg; SAR(10 g) = 0.268 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.641 W/kg



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Plot 3

DUT: PRO460; Type: Wireless TV Video Case; Serial: AVWPRO40523008993

Communication System: LTE (SC-FDMA, 1 RB, 15 MHz, QPSK); Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: HSL750; Medium parameters used (interpolated): f = 707.5 MHz; σ = 0.888 S/m; ε_r = 41.138; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 9/11/2023; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7530; ConvF(9.62, 9.26, 10.37); Calibrated: 1/17/2023
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/19/2023
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

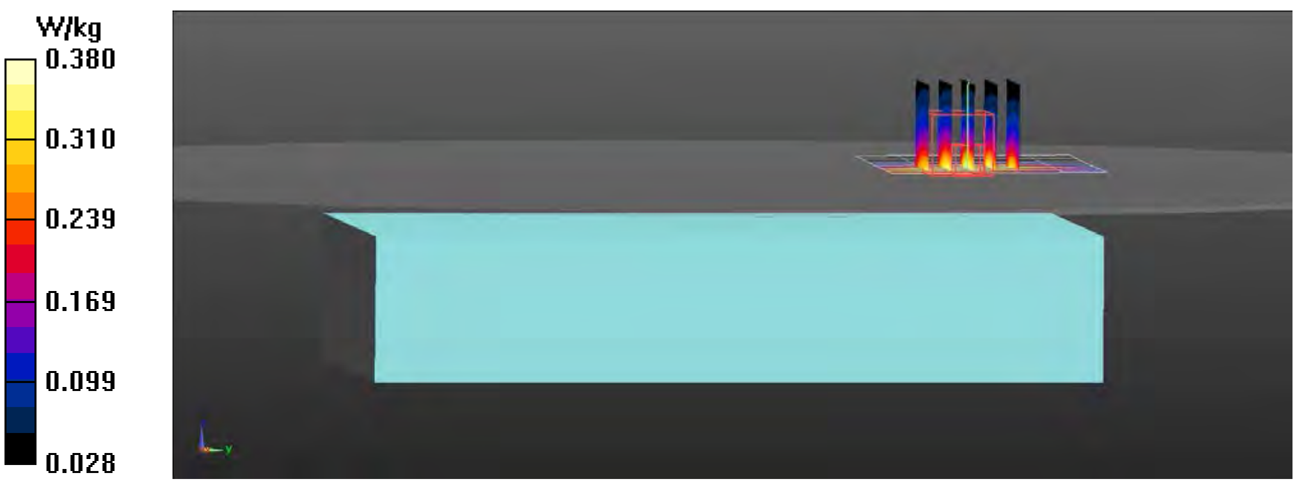
Procedure Notes:

n12 LTE/Ant M2 Mid 1 RB 37 Offset/Area Scan (7x6x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.381 W/kg

n12 LTE/Ant M2 Mid 1 RB 37 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.818 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.437 W/kg
SAR(1 g) = 0.303 W/kg; SAR(10 g) = 0.205 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.380 W/kg



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Plot 4

DUT: PRO460; Type: Wireless TV Video Case; Serial: AVWPRO40523008993

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 1882.5 MHz; Duty Cycle: 1:1
Medium: HSL1900; Medium parameters used (interpolated): f = 1882.5 MHz; σ = 1.42 S/m; ε_r = 39.685; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 9/13/2023; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7530; ConvF(8.14, 8.08, 8.31); Calibrated: 1/17/2023
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/19/2023
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

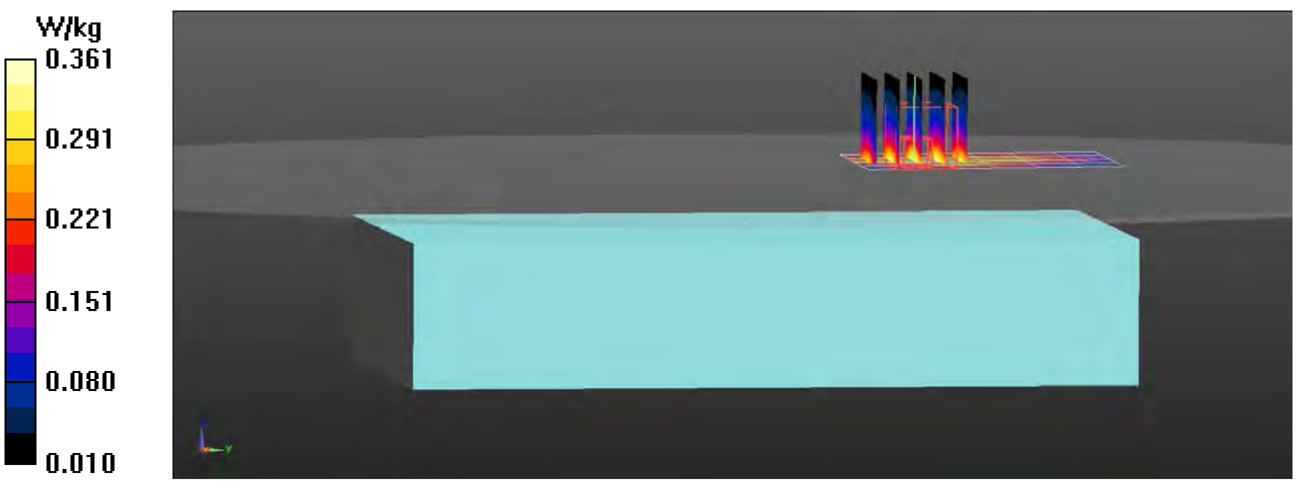
Procedure Notes:

n25 LTE/Ant M2 Mid 1 RB 49 Offset/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.343 W/kg

n25 LTE/Ant M2 Mid 1 RB 49 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.340 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.428 W/kg
SAR(1 g) = 0.277 W/kg; SAR(10 g) = 0.174 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.361 W/kg



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Plot 5

DUT: PRO460; Type: Wireless TV Video Case; Serial: AVWPRO40523008993

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 2595 MHz; Duty Cycle: 1:1
Medium: HSL2550; Medium parameters used (interpolated): f = 2595 MHz; σ = 1.98 S/m; ε_r = 38.595; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 9/13/2023; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7530; ConvF(7.54, 7.33, 7.61); Calibrated: 1/17/2023
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/19/2023
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

n38 LTE/Ant M2 Mid 1 RB 49 Offset/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.670 W/kg

n38 LTE/Ant M2 Mid 1 RB 49 Offset/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.178 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.848 W/kg
SAR(1 g) = 0.498 W/kg; SAR(10 g) = 0.281 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.677 W/kg

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Plot 6

DUT: PRO460; Type: Wireless TV Video Case; Serial: AVWPRO40523008993

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 3625 MHz; Duty Cycle: 1:1
Medium: HSL3600; Medium parameters used (interpolated): f = 3625 MHz; σ = 3.055 S/m; ε_r = 37.105; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 9/14/2023; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7530; ConvF(6.51, 6.52, 6.65); Calibrated: 1/17/2023
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/19/2023
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

n48 LTE/Ant M2 Mid 1 RB 99 Offset/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.698 W/kg

n48 LTE/Ant M2 Mid 1 RB 99 Offset/Zoom Scan (10x9x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=4mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.02 W/kg
SAR(1 g) = 0.450 W/kg; SAR(10 g) = 0.201 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.701 W/kg

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Plot 7

DUT: PRO460; Type: Wireless TV Video Case; Serial: AVWPRO40523008993

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 1745 MHz; Duty Cycle: 1:1
Medium: HSL1750; Medium parameters used (interpolated): f = 1745 MHz; σ = 1.385 S/m; ε_r = 39.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 9/12/2023; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7530; ConvF(8.28, 8.22, 8.47); Calibrated: 1/17/2023
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/19/2023
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

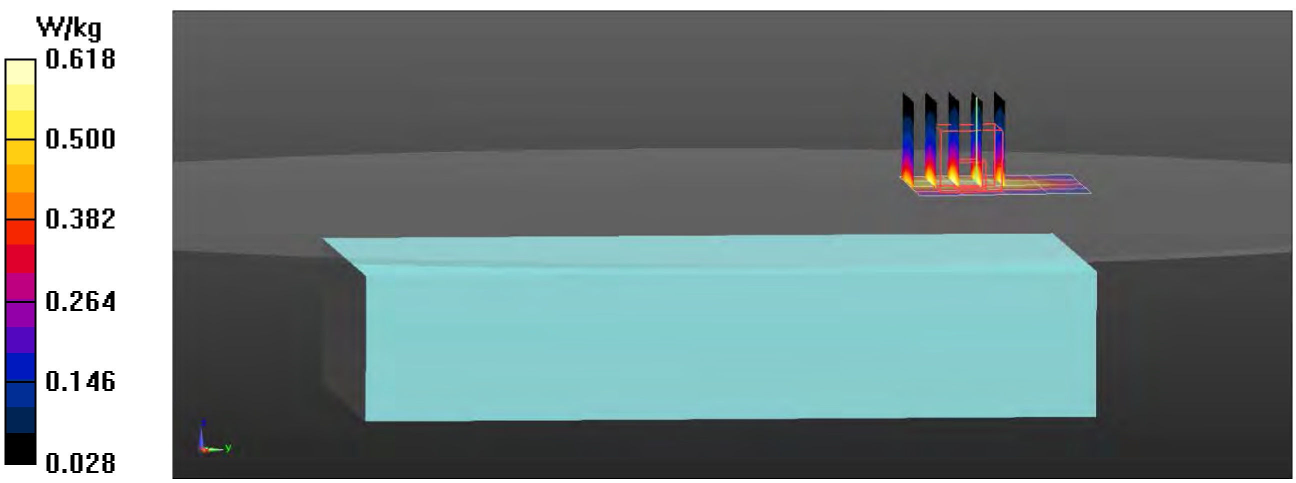
Procedure Notes:

n66 LTE/Ant M2 Mid 1 RB 49 Offset/Area Scan (5x5x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.604 W/kg

n66 LTE/Ant M2 Mid 1 RB 49 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.344 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.722 W/kg
SAR(1 g) = 0.499 W/kg; SAR(10 g) = 0.329 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.618 W/kg



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Plot 8

DUT: PRO460; Type: Wireless TV Video Case; Serial: AVWPRO40523008993

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 680.5 MHz; Duty Cycle: 1:1
Medium: HSL750; Medium parameters used (interpolated): f = 680.5 MHz; σ = 0.871 S/m; ε_r = 41.307; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 9/11/2023; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7530; ConvF(9.62, 9.26, 10.37); Calibrated: 1/17/2023
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/19/2023
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

n71 LTE/Ant M2 Mid 1 RB 49 Offset/Area Scan (7x6x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.322 W/kg

n71 LTE/Ant M2 Mid 1 RB 49 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.994 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.381 W/kg
SAR(1 g) = 0.268 W/kg; SAR(10 g) = 0.182 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.331 W/kg

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Plot 9

DUT: PRO460; Type: Wireless TV Video Case; Serial: AVWPRO40523008993

Communication System: LTE (SC-FDMA, 1 RB, 40 MHz, QPSK); Frequency: 3750 MHz; Duty Cycle: 1:1
Medium: HSL3600; Medium parameters used (interpolated): f = 3750 MHz; σ = 3.19 S/m; ε_r = 36.96; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 9/14/2023; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7530; ConvF(6.51, 6.52, 6.65); Calibrated: 1/17/2023
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1416; Calibrated: 4/19/2023
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 2037
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

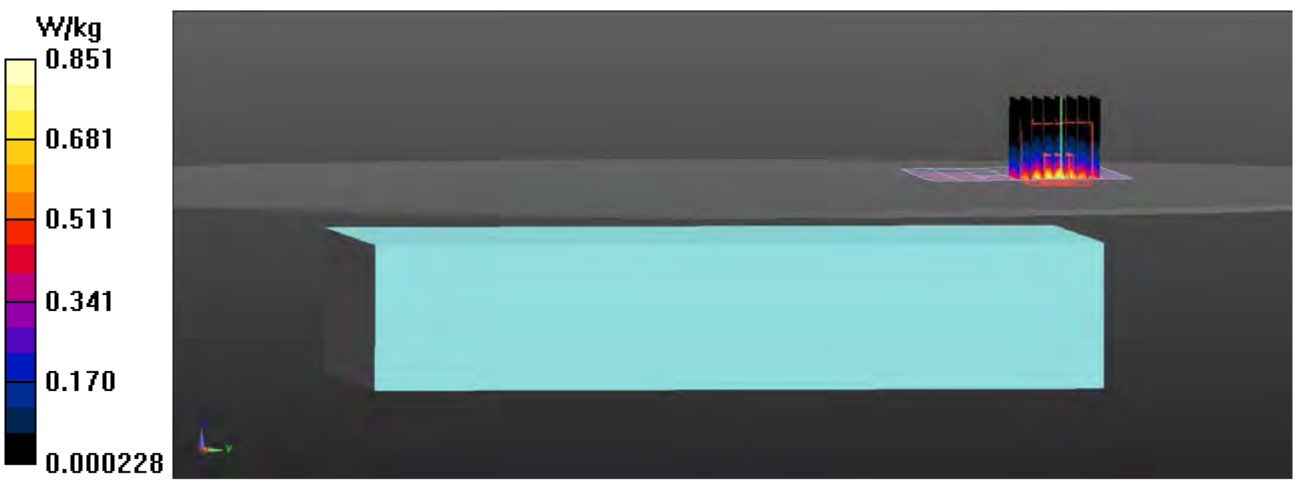
Procedure Notes:

n77 LTE/Ant M2 Mid 1 RB 99 Offset/Area Scan (9x8x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.751 W/kg

n77 LTE/Ant M2 Mid 1 RB 99 Offset/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=4mm
Reference Value = 4.817 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.22 W/kg
SAR(1 g) = 0.542 W/kg; SAR(10 g) = 0.253 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.851 W/kg



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Appendix C – SAR Test Setup Photos

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Test Position Back 15 mm Gap

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Photo Removed

Front of Device

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Cable Side of Device

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Battery

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Appendix D – Probe Calibration Data Sheets

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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**
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 **RF Exposure Lab**

Certificate No **EX-7530_Jan23**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:7530

Calibration procedure(s): QA CAL-01.v10, QA CAL-12.v10, QA CAL-14.v7, QA CAL-23.v6, QA CAL-25.v8
Calibration procedure for dosimetric E-field probes

Calibration date: January 17, 2023

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 Calibration
Power meter NRP	SN: 104778	04-Apr-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
OCP DAK-3.5 (weighted)	SN: 1249	20-Oct-22 (OCP-DAK3.5-1249_Oct22)	Oct-23
OCP DAK-12	SN: 1016	20-Oct-22 (OCP-DAK12-1016_Oct22)	Oct-23
Reference 20 dB Attenuator	SN: CC2552 (20x)	04-Apr-22 (No. 217-03527)	Apr-23
DAE4	SN: 660	10-Oct-22 (No. DAE4-660_Oct22)	Oct-23
Reference Probe ES3DV2	SN: 3013	06-Jan-23 (No. ES3-3013_Jan23)	Jan-24

Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-22)	In house check: Jun-24
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

	Name	Function	Signature
Calibrated by	Joanna Lleshaj	Laboratory Technician	[signature]
Approved by	Sven Kühn	Technical Manager	[signature]

Issued: January 23, 2023

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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.e., $\vartheta = 0$ 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) 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.
b) 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 $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect 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 with CW signal. 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; Dx,y,z; VRx,y,z: A, B, C, D* 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 $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values 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 ±50 MHz to ±100 MHz.
- *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).

Parameters of Probe: EX3DV4 - SN:7530

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k = 2)
Norm ($\mu V/(V/m)^2$) [A]	0.42	0.53	0.42	±10.1%
DCP (mV) [B]	96.0	95.0	98.0	±4.7%

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B $dB\sqrt{\mu V}$	C	D dB	VR mV	Max dev.	Max Unc[E] k = 2
0	CW	X	0.00	0.00	1.00	0.00	128.4	±2.5%	±4.7%
		Y	0.00	0.00	1.00		120.9		
		Z	0.00	0.00	1.00		104.7		

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 5).
[B] Linearization parameter uncertainty for maximum specified field strength.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

Parameters of Probe: EX3DV4 - SN:7530

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle	35.7°
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

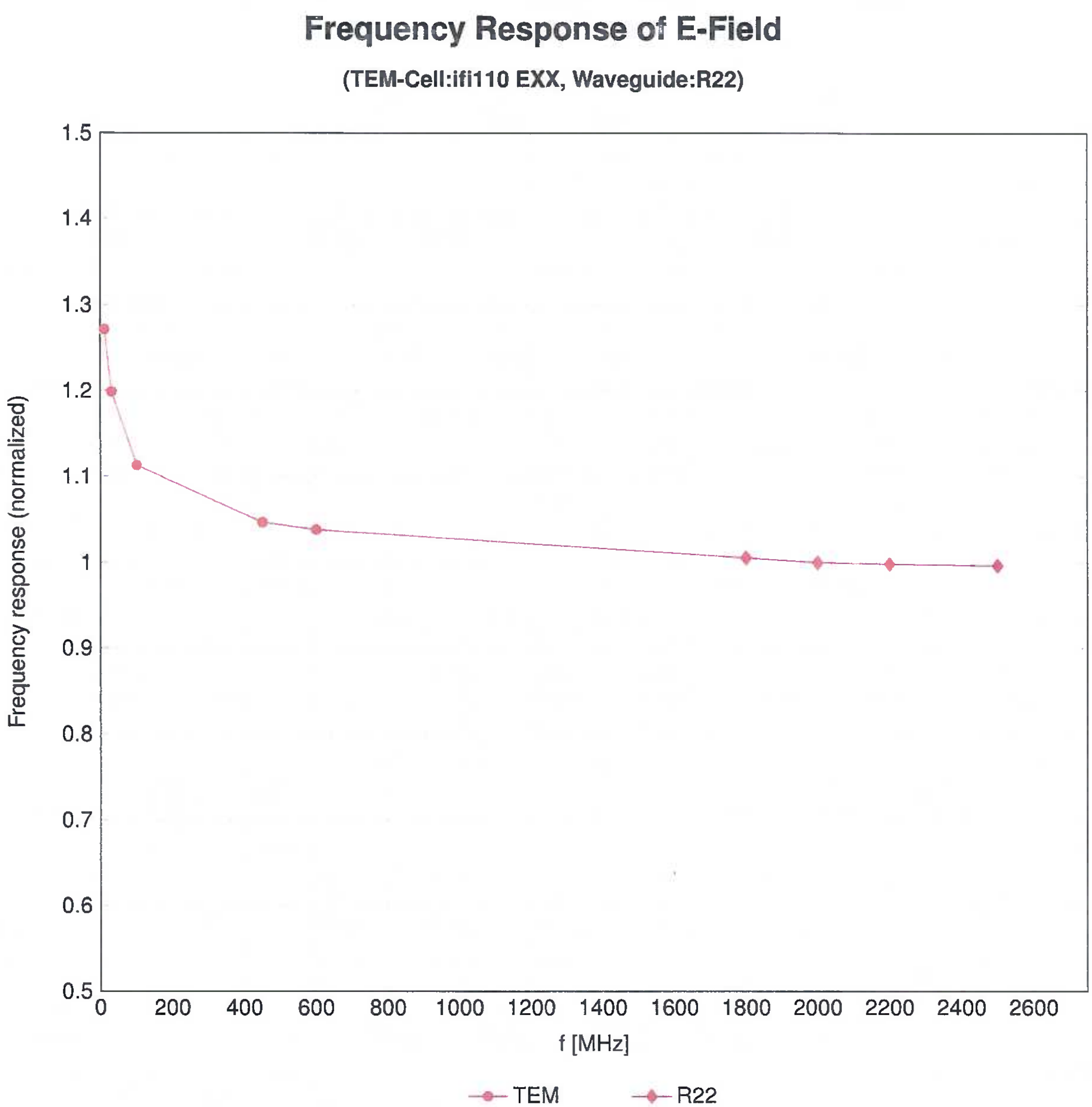
Note: Measurement distance from surface can be increased to 3–4 mm for an *Area Scan* job.

Parameters of Probe: EX3DV4 - SN:7530

Calibration Parameter Determined in Head Tissue Simulating Media

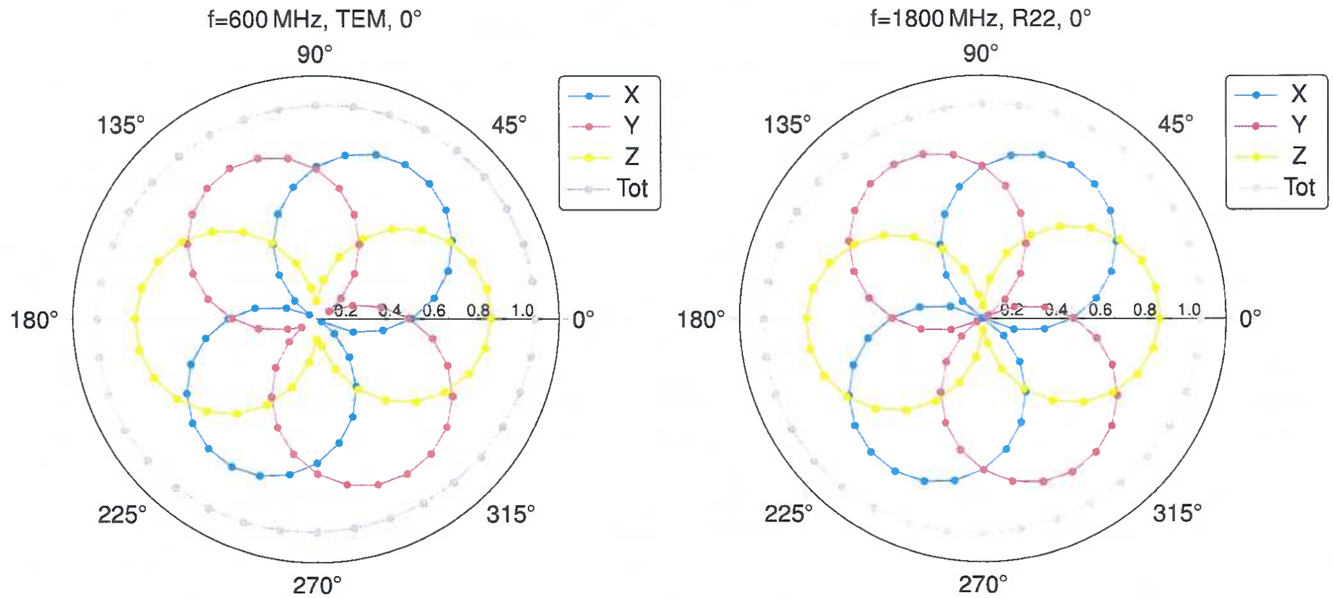
f (MHz)[C]	Relative Permittivity[F]	Conductivity[F] (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unc ($k = 2$)
13	55.0	0.75	22.02	22.02	22.02	0.00	1.25	±13.3%
30	55.0	0.75	19.87	19.87	19.87	0.00	1.25	±13.3%
750	41.9	0.89	9.62	9.26	10.37	0.35	1.27	±12.0%
900	41.5	0.97	9.50	9.25	9.30	0.35	1.27	±12.0%
1300	40.8	1.14	8.19	8.15	8.38	0.40	1.27	±12.0%
1750	40.1	1.37	8.28	8.22	8.47	0.28	1.27	±12.0%
1900	40.0	1.40	8.14	8.08	8.31	0.29	1.27	±12.0%
2300	39.5	1.67	7.59	7.55	7.71	0.30	1.27	±12.0%
2450	39.2	1.80	7.18	7.11	7.21	0.32	1.27	±12.0%
2600	39.0	1.96	7.54	7.33	7.61	0.32	1.27	±12.0%
3300	38.2	2.71	6.92	6.92	7.03	0.35	1.27	±14.0%
3500	37.9	2.91	6.65	6.65	6.76	0.36	1.27	±14.0%
3700	37.7	3.12	6.51	6.52	6.65	0.37	1.27	±14.0%
3900	37.5	3.32	6.83	6.80	6.94	0.37	1.27	±14.0%
4200	37.1	3.63	6.47	6.47	6.61	0.37	1.27	±14.0%
4600	36.7	4.04	6.22	6.23	6.35	0.40	1.27	±14.0%
4950	36.3	4.40	5.65	5.58	5.83	0.43	1.36	±14.0%
5250	35.9	4.71	5.26	5.20	5.38	0.34	1.62	±14.0%
5600	35.5	5.07	4.49	4.39	4.63	0.41	1.67	±14.0%
5750	35.4	5.22	4.60	4.58	4.72	0.43	1.75	±14.0%

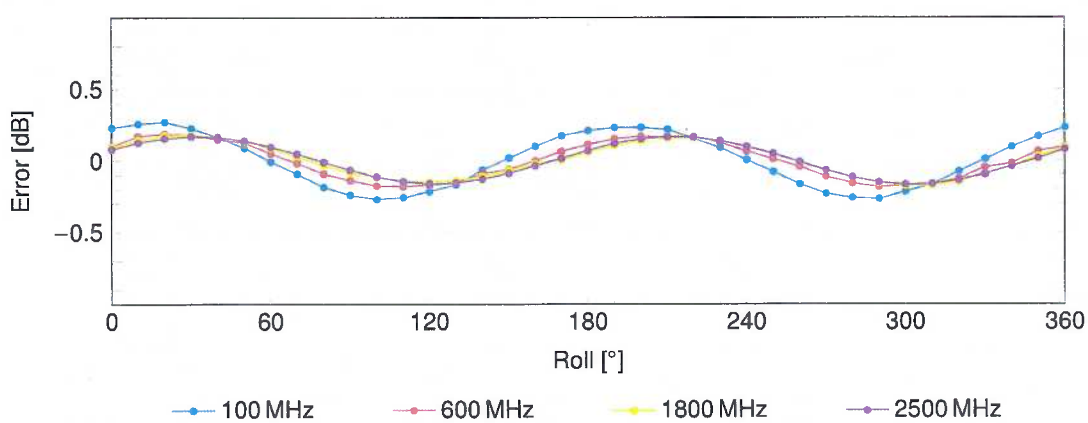
[C] Frequency validity above 300 MHz of ±100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ±50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ±10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4–9 MHz, and ConvF assessed at 13 MHz is 9–19 MHz. Above 5 GHz frequency validity can be extended to ±110 MHz.
[F] The probes are calibrated using tissue simulating liquids (TSL) that deviate for ε and σ by less than ±5% from the target values (typically better than ±3%) and are valid for TSL with deviations of up to ±10%. If TSL with deviations from the target of less than ±5% are used, the calibration uncertainties are 11.1% for 0.7 - 3 GHz and 13.1% for 3 - 6 GHz.
[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 frequencies between 3–6 GHz at any distance larger than half the probe tip diameter from the boundary.



Uncertainty of Frequency Response of E-field: ±6.3% (k=2)

Receiving Pattern (ϕ), $\vartheta = 0°$

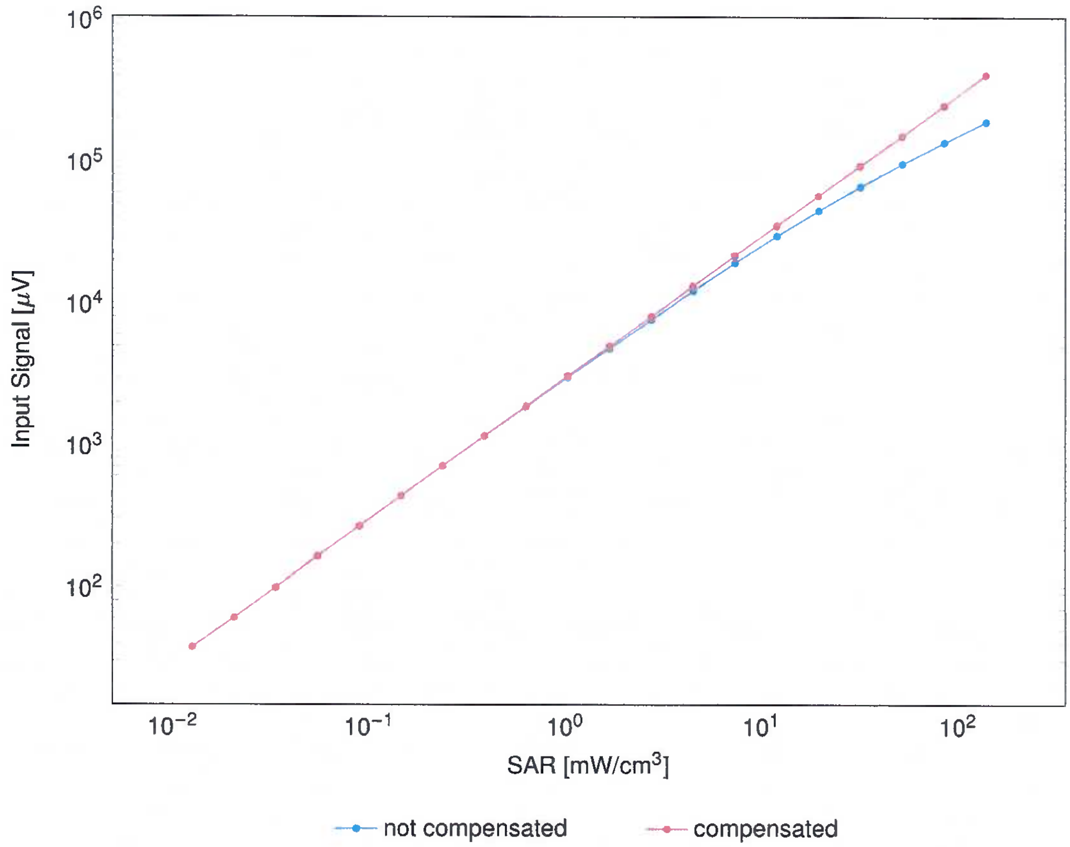


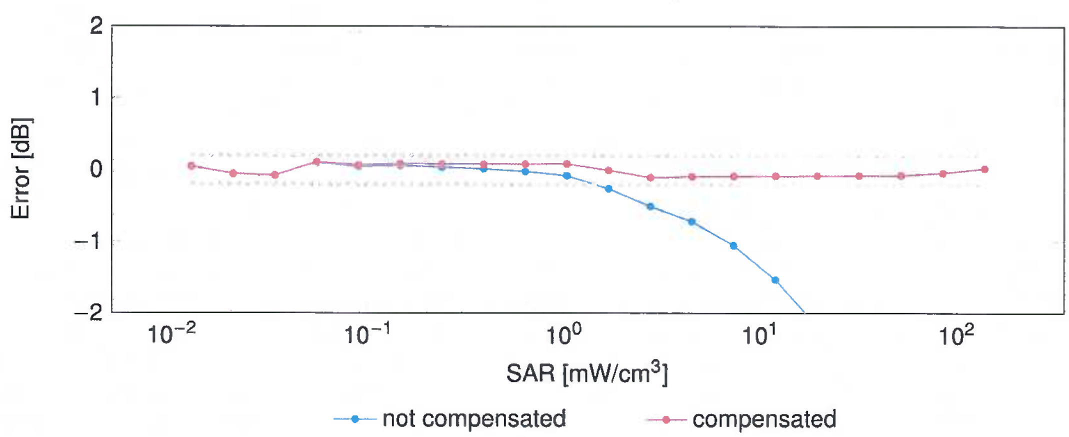


Uncertainty of Axial Isotropy Assessment: ±0.5% (k=2)

Dynamic Range f(SAR_{head})

(TEM cell, $f_{eval} = 1900$ MHz)

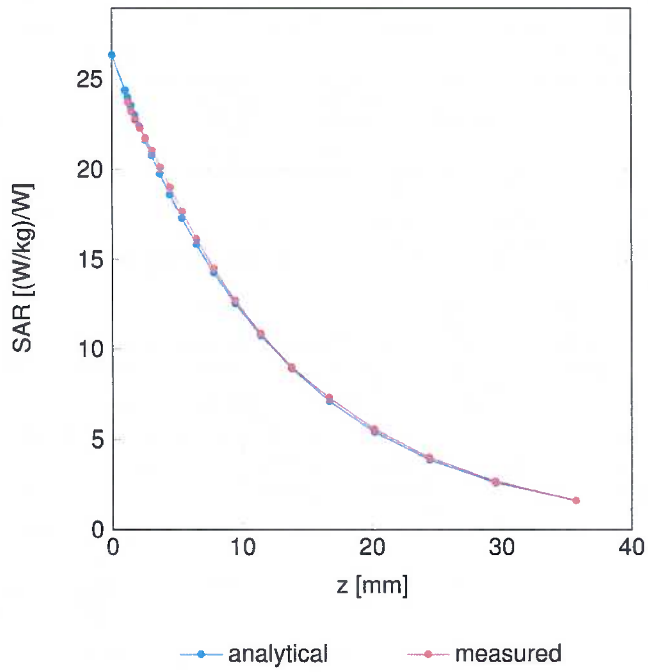




Uncertainty of Linearity Assessment: ±0.6% (k=2)

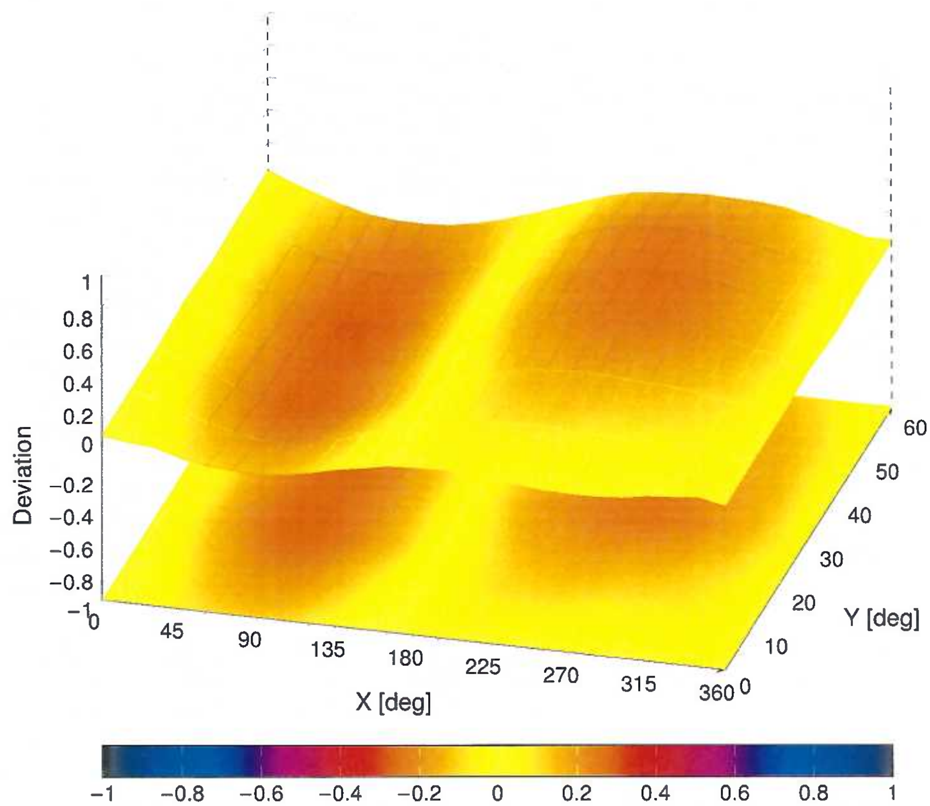
Conversion Factor Assessment

f=1900 MHz, WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, θ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ±2.6% (k=2)

Appendix E – Dipole Calibration Data Sheets

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jm

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

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Accreditation No.: SCS 0108

Client **RF Exposure Lab**

Certificate No: D750V3-1053_Jun21

CALIBRATION CERTIFICATE

Object	D750V3 - SN:1053
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz
Calibration date:	June 04, 2021

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EX3DV4	SN: 7349	28-Dec-20 (No. EX3-7349_Dec20)	Dec-21
DAE4	SN: 601	02-Nov-20 (No. DAE4-601_Nov20)	Nov-21

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 8, 2021

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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:

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”

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.7 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.57 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.58 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	56.5 Ω + 0.1 jΩ
Return Loss	- 24.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.035 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

Extended Calibration
Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (<-20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB Publication 865664 D01 v01r04.

D750V3 SN: 1053 - Head						
Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
6/4/2021	-24.3		56.5		0.1	
6/4/2022	-26.2	7.8	57.9	1.4	0.3	0.2
6/6/2023	-25.6	5.3	55.2	-1.3	0.4	0.3

DASY5 Validation Report for Head TSL

Date: 04.06.2021

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1053

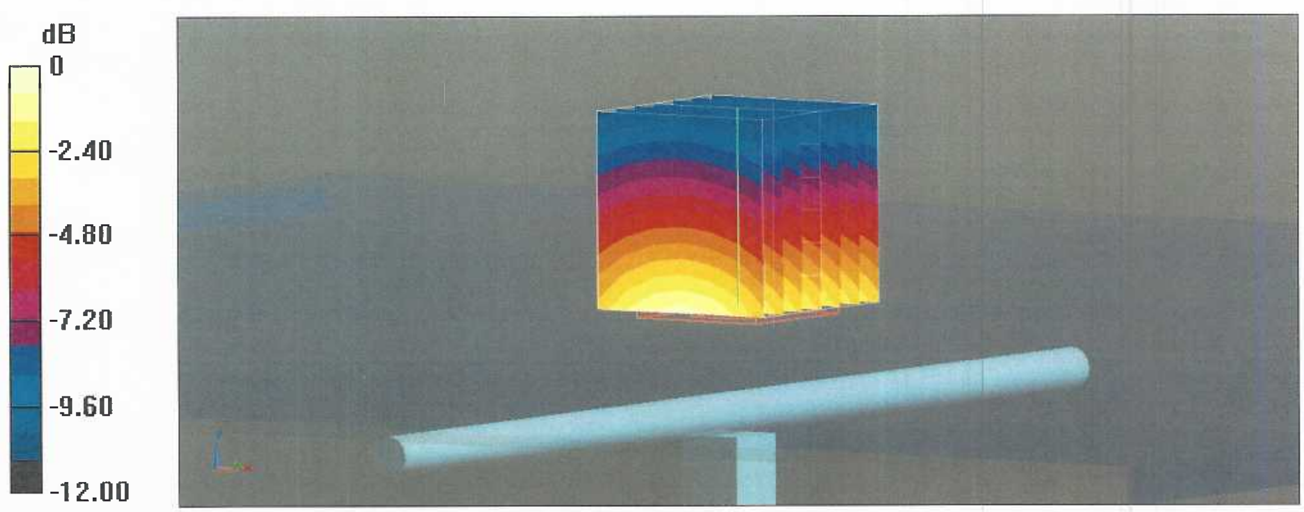
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma = 0.91$ S/m; $\varepsilon_r = 42.7$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.11, 10.11, 10.11) @ 750 MHz; Calibrated: 28.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

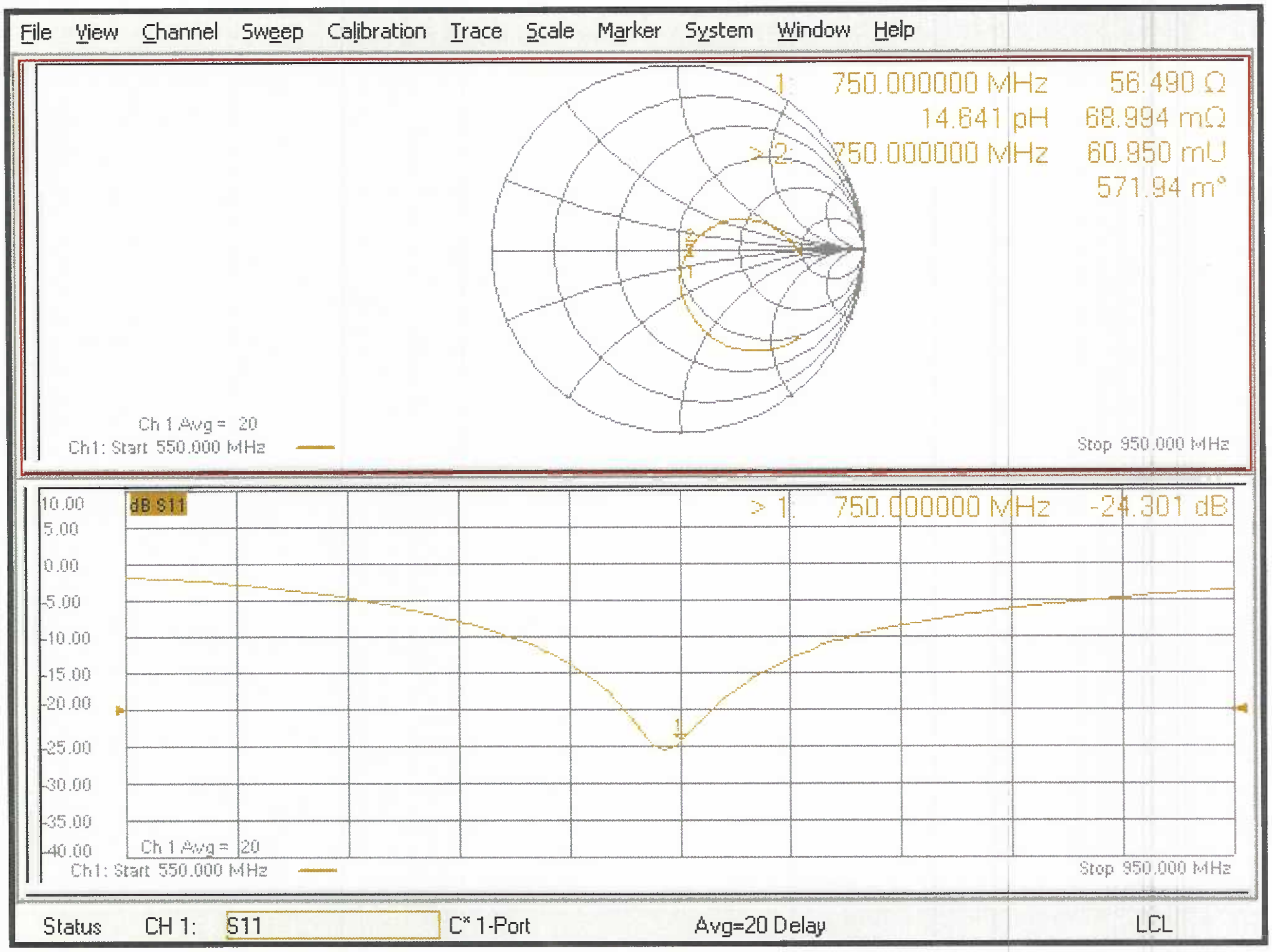
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.74 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.30 W/kg
SAR(1 g) = 2.17 W/kg; SAR(10 g) = 1.41 W/kg
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid (> 30mm)
Ratio of SAR at M2 to SAR at M1 = 65.5%
Maximum value of SAR (measured) = 2.93 W/kg



0 dB = 2.93 W/kg = 4.67 dBW/kg

Impedance Measurement Plot for Head TSL



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Accreditation No.: SCS 0108

Client **RF Exposure Lab**

Certificate No: D900V2-1d128_Jun21

CALIBRATION CERTIFICATE

Object	D900V2 - SN:1d128
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz
Calibration date:	June 04, 2021

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EX3DV4	SN: 7349	28-Dec-20 (No. EX3-7349_Dec20)	Dec-21
DAE4	SN: 601	02-Nov-20 (No. DAE4-601_Nov20)	Nov-21

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 8, 2021

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

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:

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"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.97 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.3 ± 6 %	0.96 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.76 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**11.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.77 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**7.14 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.0 Ω - 0.6 jΩ
Return Loss	- 38.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.412 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

Extended Calibration
Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (<-20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB Publication 865664 D01 v01r04.

D900V2 SN: 1d128 - Head						
Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
6/4/2021	-38.5		51.0		-0.6	
6/4/2022	-37.2	-3.4	52.3	1.3	-0.8	-0.2
6/6/2023	-36.8	-4.4	52.9	1.9	-0.7	-0.1

DASY5 Validation Report for Head TSL

Date: 04.06.2021

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:1d128

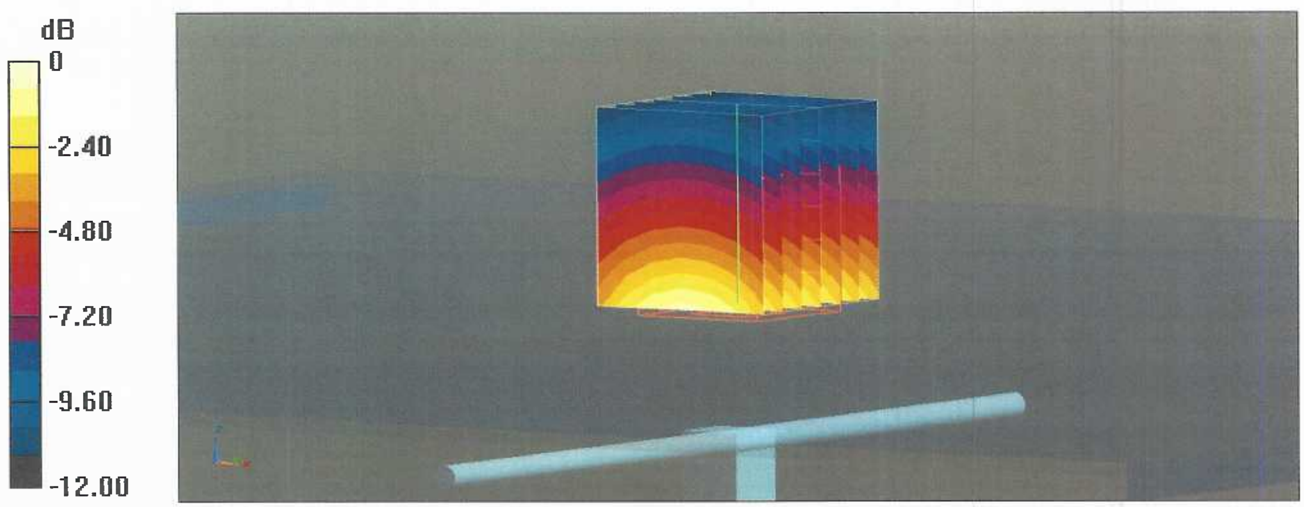
Communication System: UID 0 - CW; Frequency: 900 MHz
Medium parameters used: f = 900 MHz; σ = 0.96 S/m; ε_r = 42.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.62, 9.62, 9.62) @ 900 MHz; Calibrated: 28.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

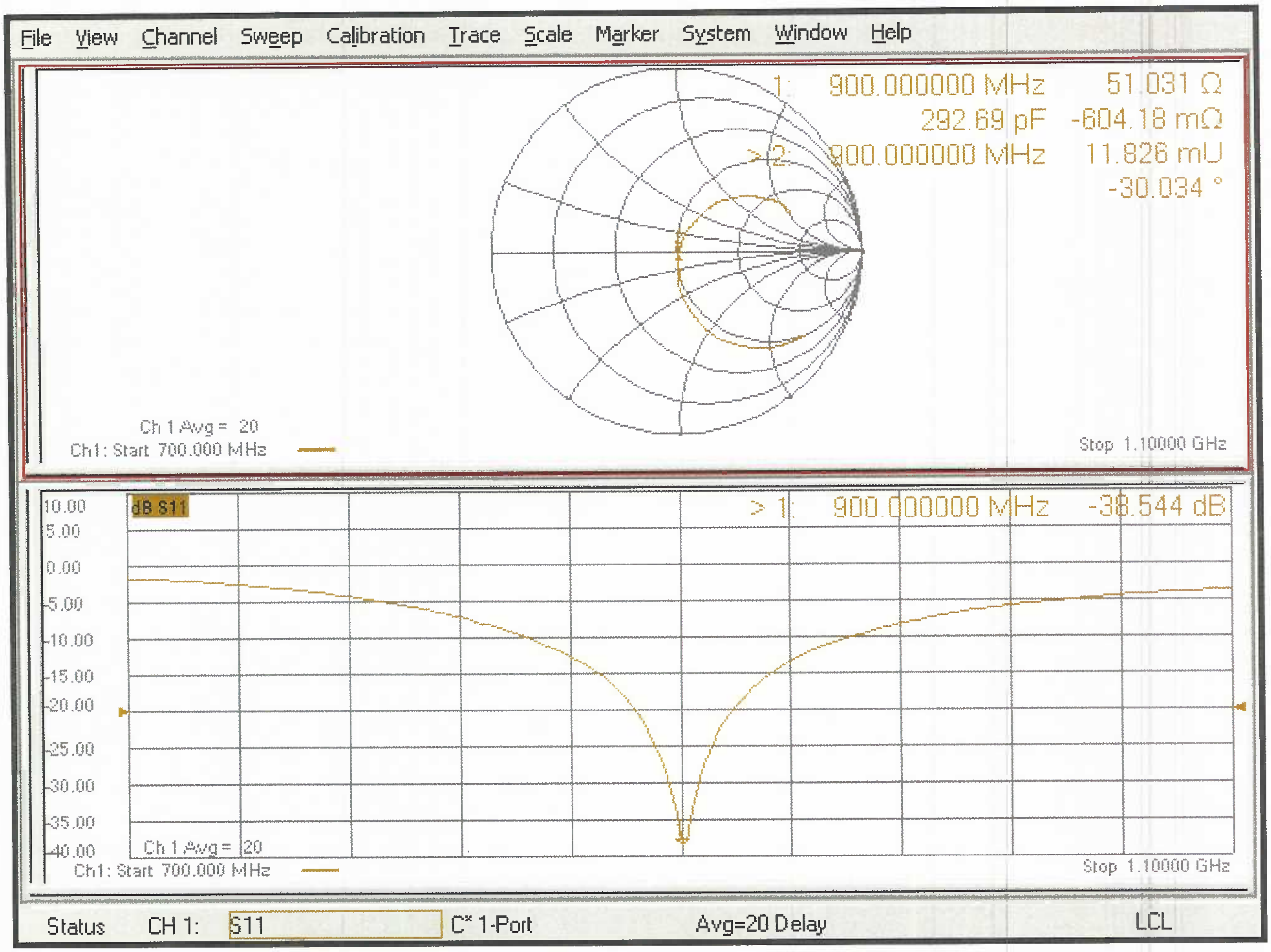
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 65.79 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 4.23 W/kg
SAR(1 g) = 2.76 W/kg; SAR(10 g) = 1.77 W/kg
Smallest distance from peaks to all points 3 dB below = 16 mm
Ratio of SAR at M2 to SAR at M1 = 65%
Maximum value of SAR (measured) = 3.74 W/kg



0 dB = 3.74 W/kg = 5.73 dBW/kg

Impedance Measurement Plot for Head TSL



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Accreditation No.: SCS 0108

Client **RF Exposure Lab**

Certificate No: D1750V2-1061_Jun21

CALIBRATION CERTIFICATE

Object	D1750V2 - SN:1061
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz
Calibration date:	June 03, 2021

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EX3DV4	SN: 7349	28-Dec-20 (No. EX3-7349_Dec20)	Dec-21
DAE4	SN: 601	02-Nov-20 (No. DAE4-601_Nov20)	Nov-21

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

	Name	Function	Signature
Calibrated by:	Jeffrey Katzman	Laboratory Technician	[signature]
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: June 8, 2021

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Swiss Calibration Service

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

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:

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”

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

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	40.7 ± 6 %	1.37 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**37.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.93 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

Impedance, transformed to feed point	49.4 Ω + 0.0 jΩ
Return Loss	- 44.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.221 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

Extended Calibration
Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (<-20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB Publication 865664 D01 v01r04.

D1750V2 SN: 1061 - Head

Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
6/3/2021	-44.5		49.4		0.0	
6/4/2022	-42.3	-4.9	47.9	-1.5	-0.2	-0.2
6/6/2023	-43.6	-2.0	48.5	-0.9	-0.3	-0.3

DASY5 Validation Report for Head TSL

Date: 03.06.2021

Test Laboratory: SPEAG, Zurich, Switzerland

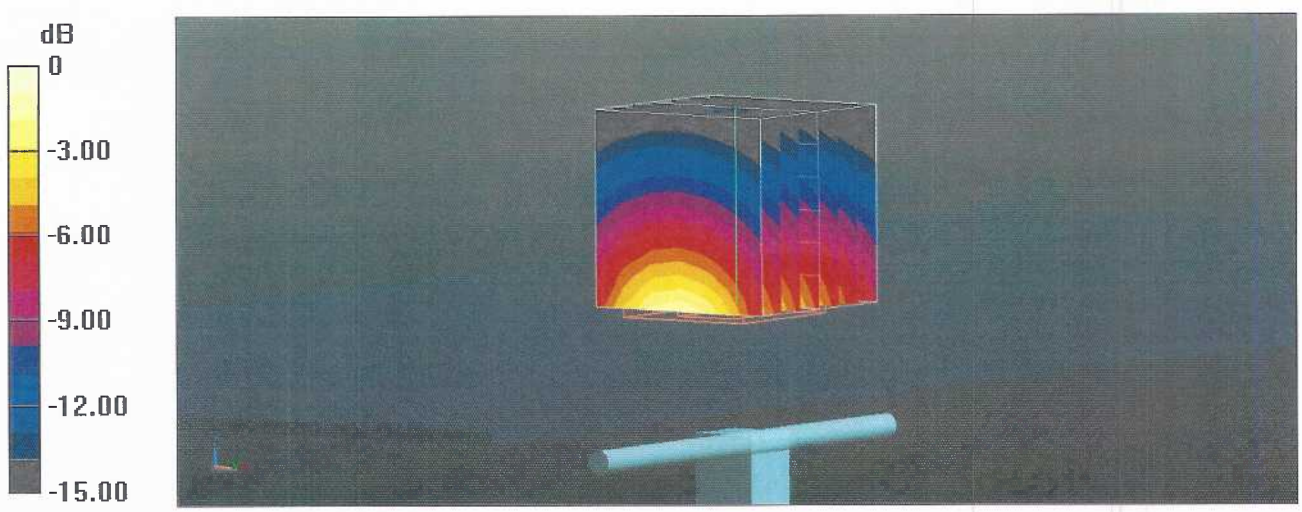
DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1061

Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.37 S/m; ε_r = 40.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

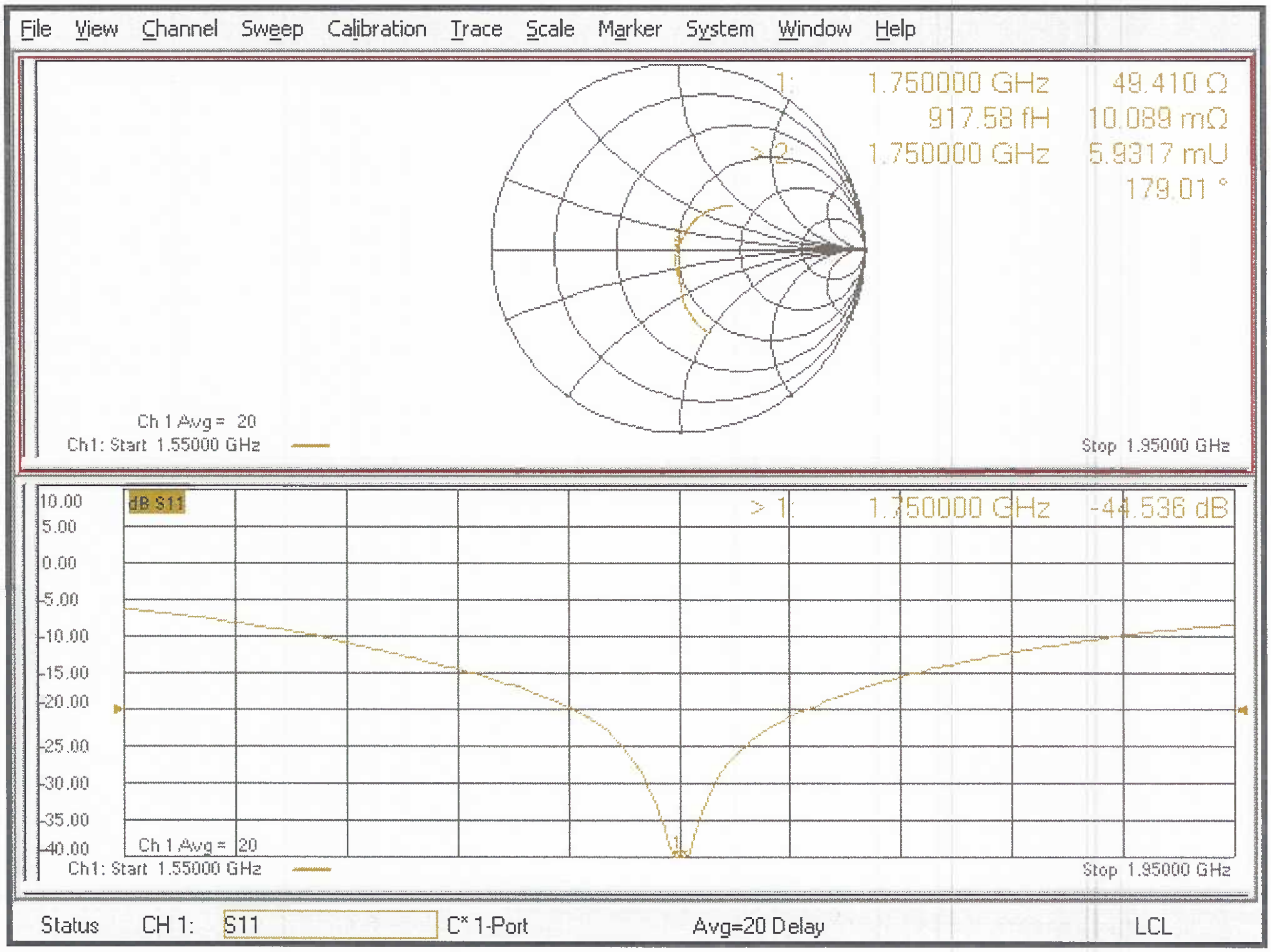
- Probe: EX3DV4 - SN7349; ConvF(8.67, 8.67, 8.67) @ 1750 MHz; Calibrated: 28.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 107.4 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 17.5 W/kg
SAR(1 g) = 9.38 W/kg; SAR(10 g) = 4.93 W/kg
Smallest distance from peaks to all points 3 dB below = 9.1 mm
Ratio of SAR at M2 to SAR at M1 = 54%
Maximum value of SAR (measured) = 14.6 W/kg



0 dB = 14.6 W/kg = 11.64 dBW/kg

Impedance Measurement Plot for Head TSL



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Accreditation No.: SCS 0108

Client **RF Exposure Lab**

Certificate No: D1900V2-5d147_Jun21

CALIBRATION CERTIFICATE

Object	D1900V2 - SN:5d147
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz
Calibration date:	June 04, 2021

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EX3DV4	SN: 7349	28-Dec-20 (No. EX3-7349_Dec20)	Dec-21
DAE4	SN: 601	02-Nov-20 (No. DAE4-601_Nov20)	Nov-21

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 8, 2021

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

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:

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"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

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	40.9 ± 6 %	1.41 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.1 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.3 Ω + 5.4 jΩ
Return Loss	- 24.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.192 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

Extended Calibration
Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (<-20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB Publication 865664 D01 v01r04.

D1900V2 SN: 5d147 - Head						
Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
6/4/2021	-24.2		53.3		5.4	
6/4/2022	-25.6	5.8	52.6	-0.7	5.7	0.3
6/6/2023	-26.2	8.3	54.6	1.3	5.5	0.1

DASY5 Validation Report for Head TSL

Date: 04.06.2021

Test Laboratory: SPEAG, Zurich, Switzerland

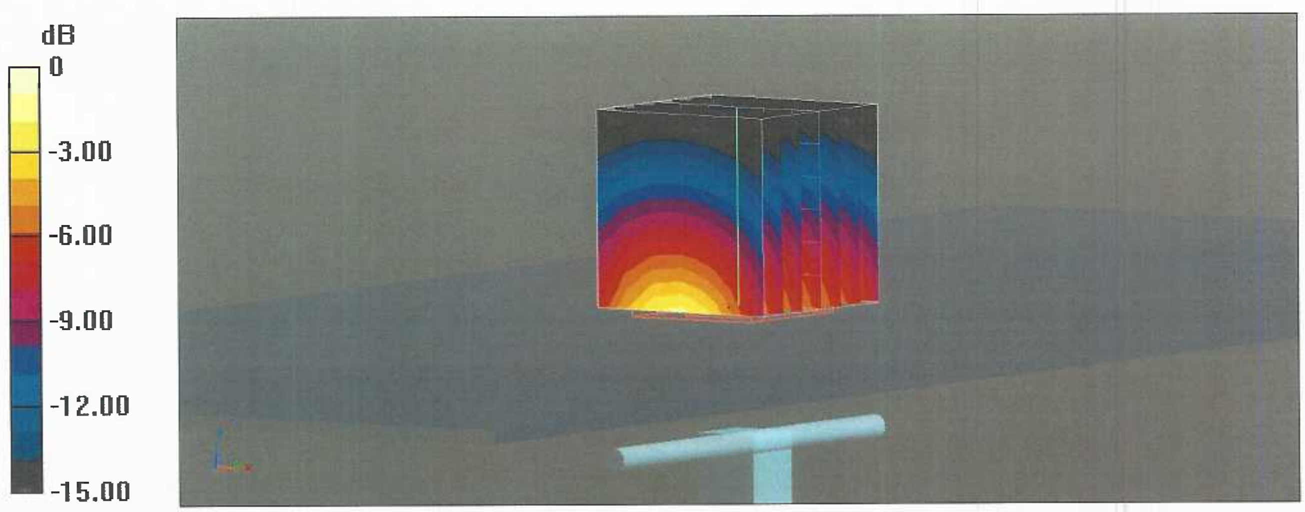
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d147

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.41 S/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

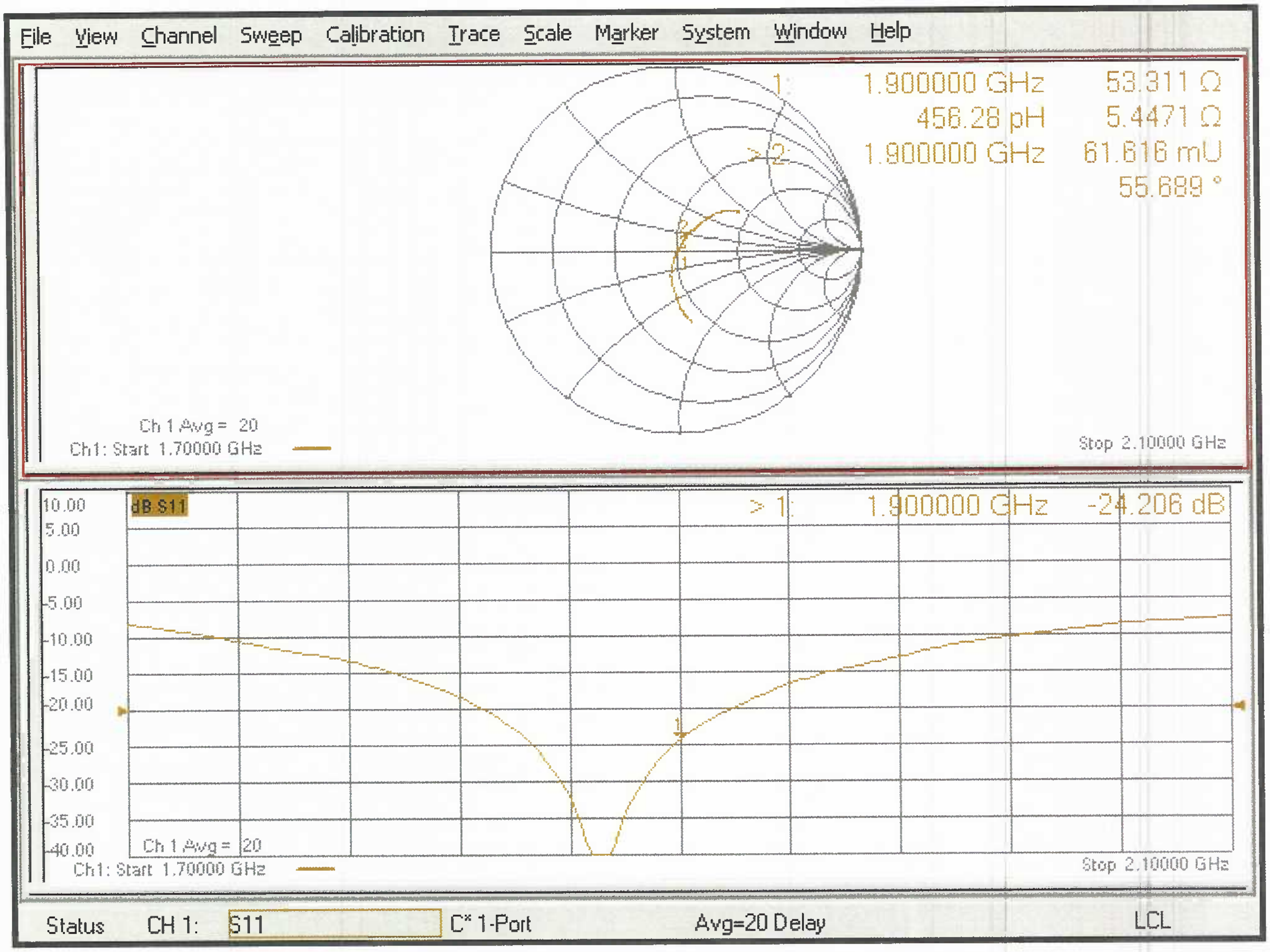
- Probe: EX3DV4 - SN7349; ConvF(8.43, 8.43, 8.43) @ 1900 MHz; Calibrated: 28.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 110.2 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 18.7 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.28 W/kg
Smallest distance from peaks to all points 3 dB below = 10 mm
Ratio of SAR at M2 to SAR at M1 = 54.6%
Maximum value of SAR (measured) = 15.6 W/kg



0 dB = 15.6 W/kg = 11.93 dBW/kg

Impedance Measurement Plot for Head TSL



Calibration Laboratory of
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S Schweizerischer Kalibrierdienst
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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 RF Exposure Lab

Certificate No: D2550V2-1003_Jun21

CALIBRATION CERTIFICATE

Object	D2550V2 - SN:1003
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz
Calibration date:	June 03, 2021

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EX3DV4	SN: 7349	28-Dec-20 (No. EX3-7349_Dec20)	Dec-21
DAE4	SN: 601	02-Nov-20 (No. DAE4-601_Nov20)	Nov-21

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

	Name	Function	Signature
Calibrated by:	Jeffrey Katzman	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 8, 2021

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

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:

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"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2550 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.1	1.91 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.3 ± 6 %	1.98 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**55.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.7 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.4 Ω - 3.5 jΩ
Return Loss	- 29.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.156 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

Extended Calibration
Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (<-20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB Publication 865664 D01 v01r04.

D2550V2 SN: 1003 - Head						
Date of Measurement	Return Loss (dB)	Δ%	Impedance (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
6/3/2021	-29.0		49.4		-3.5	
6/4/2022	-28.6	-1.4	48.5	-0.9	-3.8	-0.3
6/6/2023	-27.3	-5.9	47.1	-2.3	-4.1	-0.6

DASY5 Validation Report for Head TSL

Date: 03.06.2021

Test Laboratory: SPEAG, Zurich, Switzerland

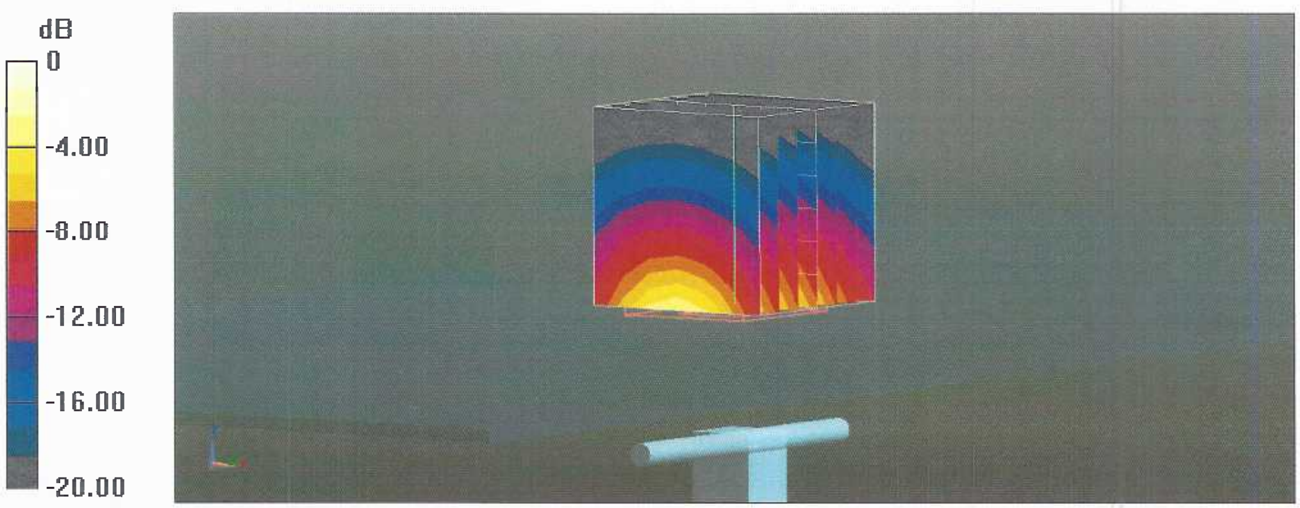
DUT: Dipole 2550 MHz; Type: D2550V2; Serial: D2550V2 - SN:1003

Communication System: UID 0 - CW; Frequency: 2550 MHz
Medium parameters used: f = 2550 MHz; σ = 1.98 S/m; ε_r = 37.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

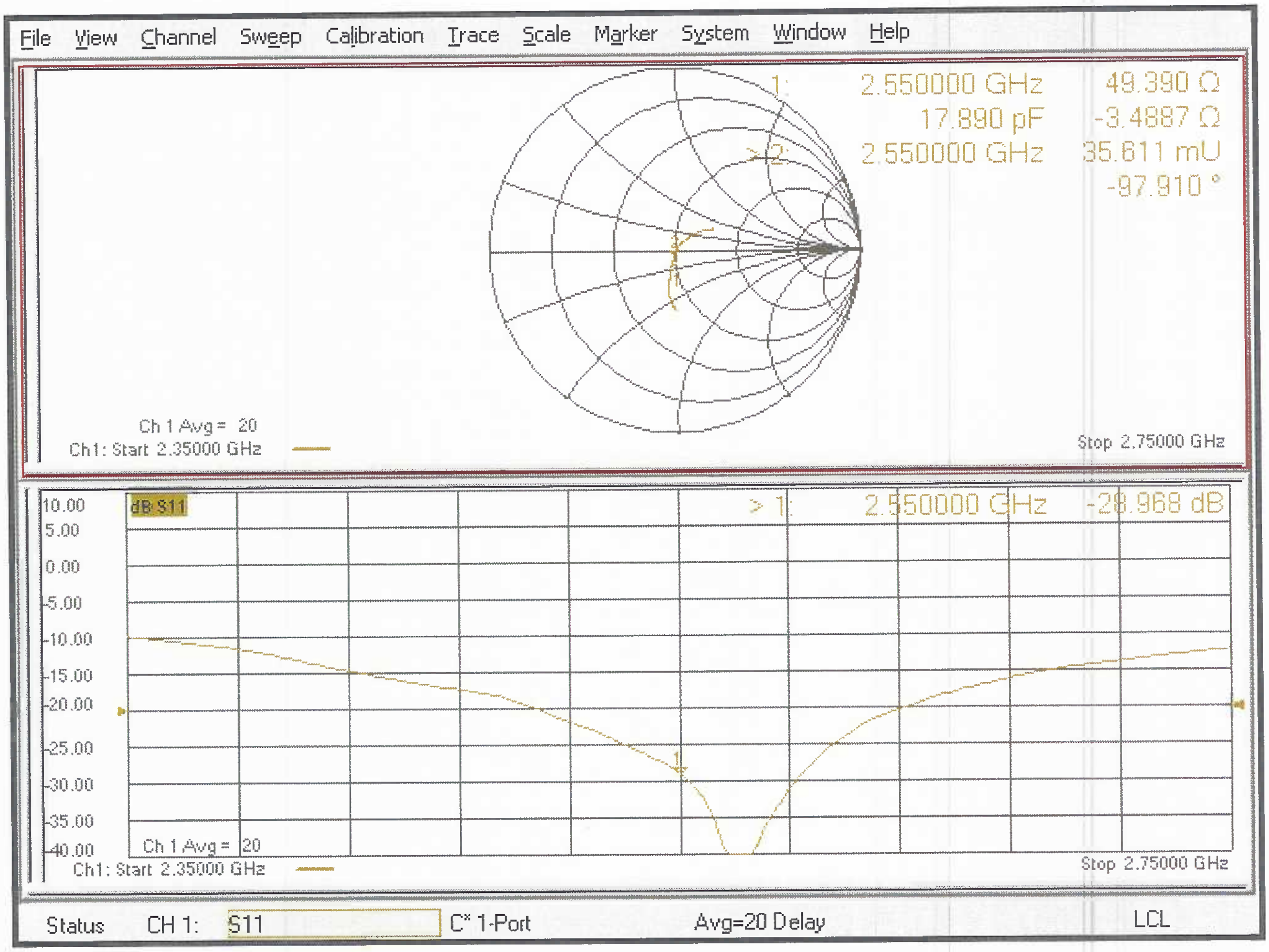
- Probe: EX3DV4 - SN7349; ConvF(7.85, 7.85, 7.85) @ 2550 MHz; Calibrated: 28.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 117.6 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 29.9 W/kg
SAR(1 g) = 14.2 W/kg; SAR(10 g) = 6.28 W/kg
Smallest distance from peaks to all points 3 dB below = 8.5 mm
Ratio of SAR at M2 to SAR at M1 = 47.1%
Maximum value of SAR (measured) = 24.3 W/kg



0 dB = 24.3 W/kg = 13.86 dBW/kg

Impedance Measurement Plot for Head TSL



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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 **RF Exposure Lab**

Certificate No: D3700V2-1024_Apr21

CALIBRATION CERTIFICATE

Object	D3700V2 - SN:1024
Calibration procedure(s)	QA CAL-22.v6 Calibration Procedure for SAR Validation Sources between 3-10 GHz
Calibration date:	April 13, 2021

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EX3DV4	SN: 3503	30-Dec-20 (No. EX3-3503_Dec20)	Dec-21
DAE4	SN: 601	02-Nov-20 (No. DAE4-601_Nov20)	Nov-21

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: April 15, 2021

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

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:

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"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	3700 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	37.7	3.12 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.0 ± 6 %	3.09 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.85 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**68.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.47 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.6 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	46.1 Ω + 2.2 jΩ
Return Loss	- 26.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.127 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

Extended Calibration
Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (<-20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB Publication 865664 D01 v01r04.

D3700V2 SN: 1024 - Head						
Date of Measurement	Return Loss (dB)	Δ%	Impedance (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
4/13/2021	-26.7		46.1		2.2	
4/13/2022	-25.3	-5.2	44.5	-1.6	1.8	-0.4
4/13/2023	-27.5	8.7	47.2	2.7	2.5	0.7

DASY5 Validation Report for Head TSL

Date: 13.04.2021

Test Laboratory: SPEAG, Zurich, Switzerland

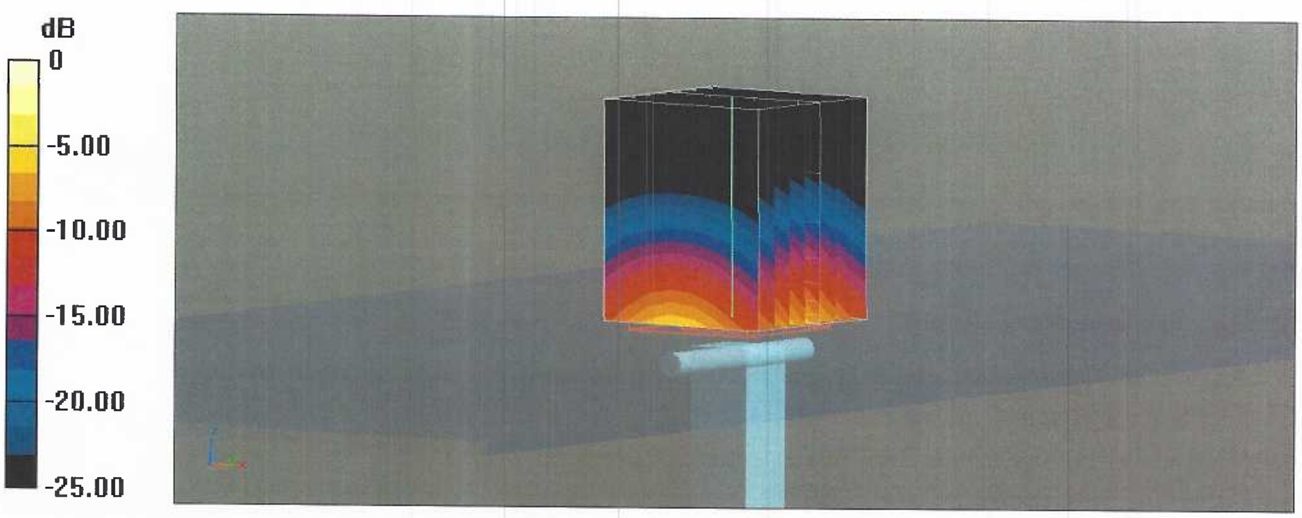
DUT: Dipole 3700 MHz; Type: D3700V2; Serial: D3700V2 - SN: 1024

Communication System: UID 0 - CW; Frequency: 3700 MHz
Medium parameters used: f = 3700 MHz; $\sigma = 3.09$ S/m; $\varepsilon_r = 37$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

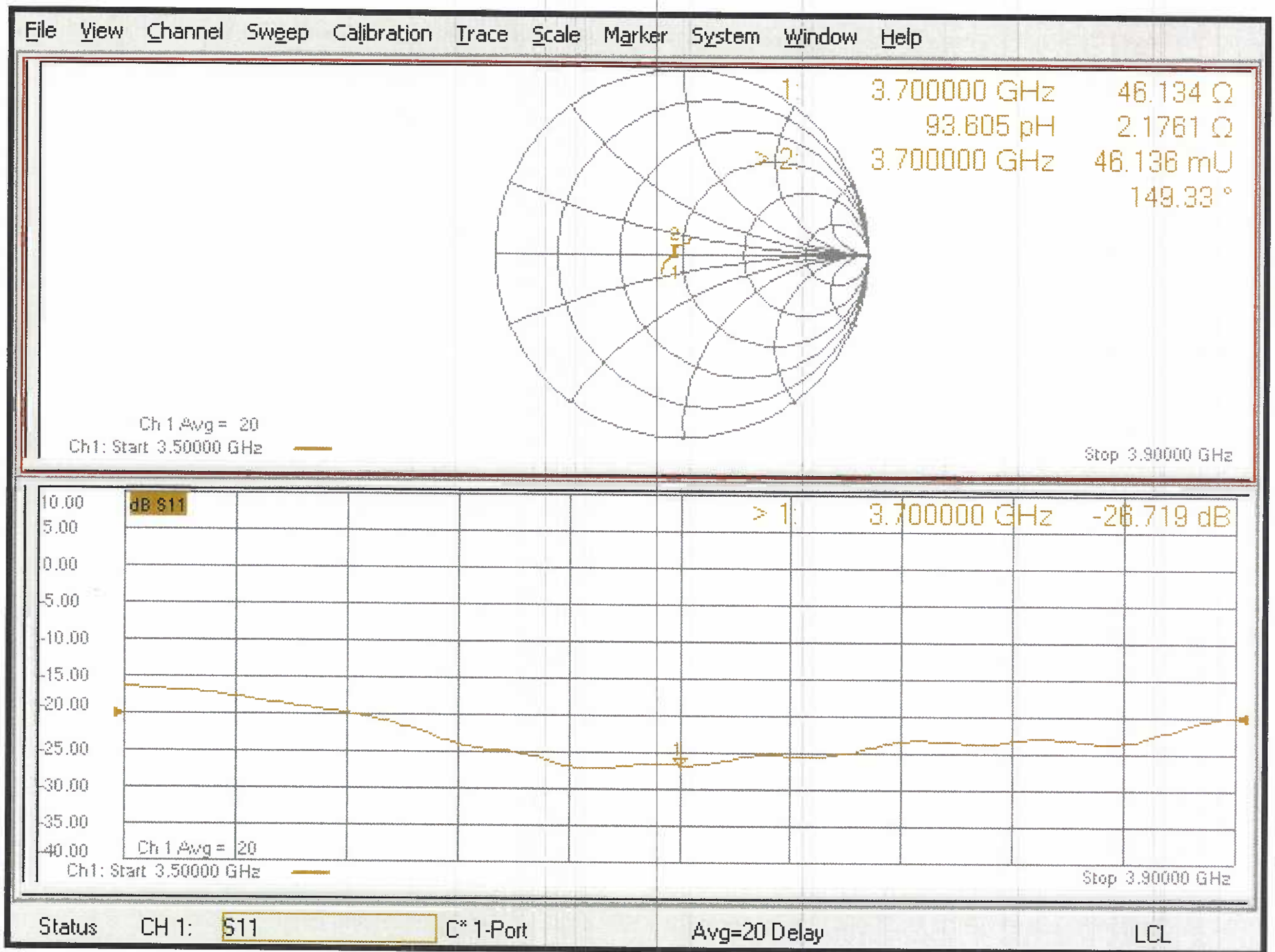
- Probe: EX3DV4 - SN3503; ConvF(7.73, 7.73, 7.73) @ 3700 MHz; Calibrated: 30.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm 3700/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.95 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 19.6 W/kg
SAR(1 g) = 6.85 W/kg; SAR(10 g) = 2.47 W/kg
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 73.2%
Maximum value of SAR (measured) = 13.7 W/kg



0 dB = 13.7 W/kg = 11.36 dBW/kg

Impedance Measurement Plot for Head TSL



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Zeughausstrasse 43, 8004 Zurich, Switzerland

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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 **RF Exposure Lab**

Certificate No: D4600V2-1080_Sep22

CALIBRATION CERTIFICATE

Object	D4600V2 - SN:1080
Calibration procedure(s)	QA CAL-22.v6 Calibration Procedure for SAR Validation Sources between 3-10 GHz
Calibration date:	September 28, 2022

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 Calibration
Power meter NRP	SN: 104778	04-Apr-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
Power sensor NRP-Z91	SN: 103245	04-Apr-22 (No. 217-03525)	Apr-23
Reference 20 dB Attenuator	SN: BH9394 (20k)	04-Apr-22 (No. 217-03527)	Apr-23
Type-N mismatch combination	SN: 310982 / 06327	04-Apr-22 (No. 217-03528)	Apr-23
Reference Probe EX3DV4	SN: 3503	08-Mar-22 (No. EX3-3503_Mar22)	Mar-23
DAE4	SN: 601	31-Aug-22 (No. DAE4-601_Aug22)	Aug-23

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Joanna Lleshaj	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	

Issued: September 29, 2022

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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:

a) 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.
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) 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 source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. 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	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	4600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	36.7	4.04 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.0 ± 6 %	3.92 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.78 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**67.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.25 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.3 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.5 Ω - 0.9 jΩ
Return Loss	- 35.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.109 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

Date: 28.09.2022

Test Laboratory: SPEAG, Zurich, Switzerland

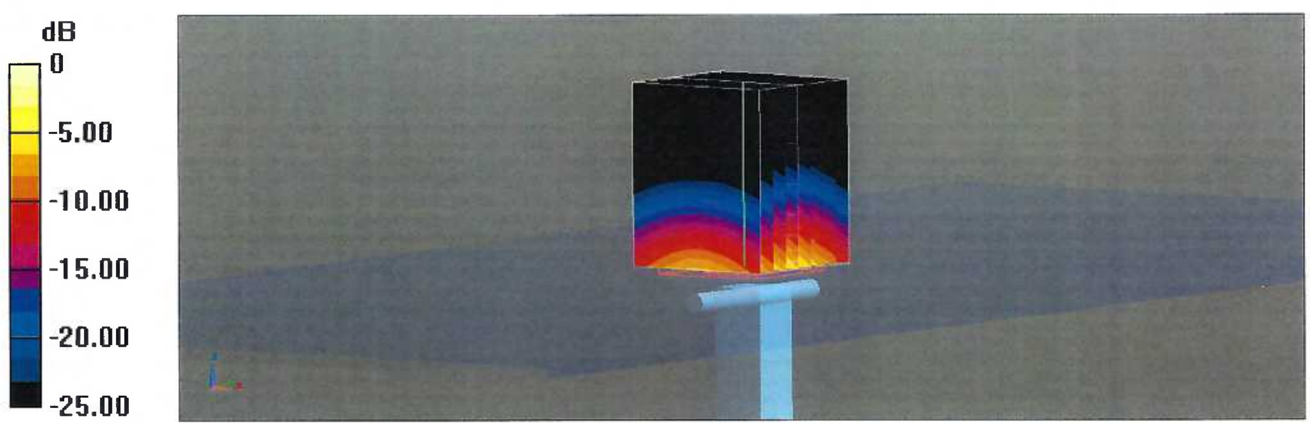
DUT: Dipole 4600 MHz; Type: D4600V2; Serial: D4600V2 - SN:1080

Communication System: UID 0 - CW; Frequency: 4600 MHz
Medium parameters used: f = 4600 MHz; σ = 3.92 S/m; ε_r = 36; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

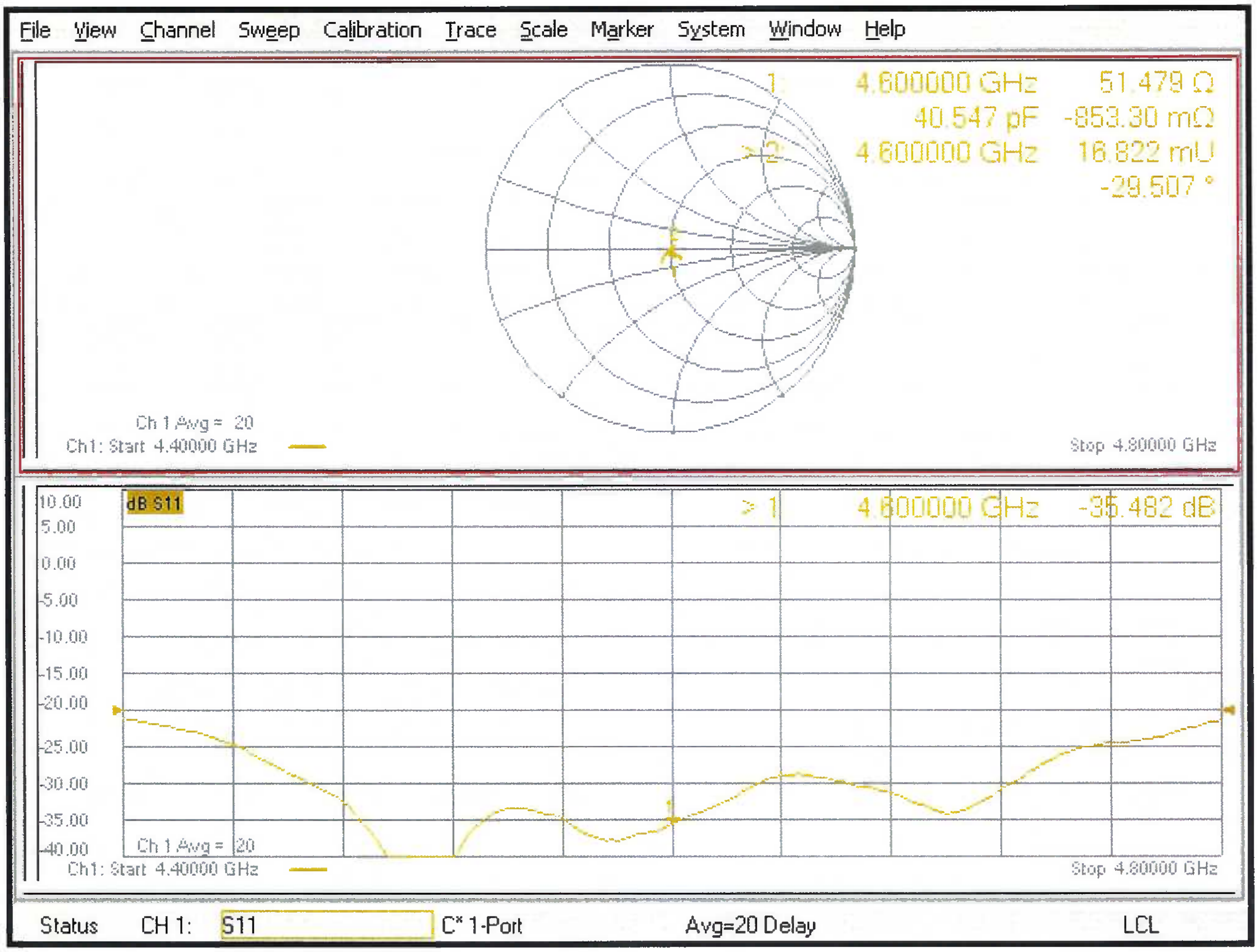
- Probe: EX3DV4 - SN3503; ConvF(6.69, 6.69, 6.69) @ 4600 MHz; Calibrated: 08.03.2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 31.08.2022
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm 4600/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.84 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 20.0 W/kg
SAR(1 g) = 6.78 W/kg; SAR(10 g) = 2.25 W/kg
Smallest distance from peaks to all points 3 dB below = 8.2 mm
Ratio of SAR at M2 to SAR at M1 = 73%
Maximum value of SAR (measured) = 14.0 W/kg



0 dB = 14.0 W/kg = 11.46 dBW/kg

Impedance Measurement Plot for Head TSL



Appendix F – DAE Calibration Data Sheets

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Accreditation No.: SCS 0108

Client **RF Exposure Lab**
San Marcos, USA

Certificate No: DAE4-1416_Apr23

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BM - SN: 1416
Calibration procedure(s)	QA CAL-06.v30 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	April 19, 2023

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 Calibration
Keithley Multimeter Type 2001	SN: 0810278	29-Aug-22 (No:34389)	Aug-23
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	27-Jan-23 (in house check)	In house check: Jan-24
Calibrator Box V2.1	SE UMS 006 AA 1002	27-Jan-23 (in house check)	In house check: Jan-24

	Name	Function	Signature
Calibrated by:	Adrian Gehring	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	i.V.

Issued: April 19, 2023

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Glossary

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

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

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

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

Calibration Factors	X	Y	Z
High Range	403.576 ± 0.02% (k=2)	403.882 ± 0.02% (k=2)	404.149 ± 0.02% (k=2)
Low Range	3.97826 ± 1.50% (k=2)	3.99531 ± 1.50% (k=2)	3.97142 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	181.0 ° ± 1 °

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	199994.69	-0.41	-0.00
Channel X	+ Input	20001.60	-1.04	-0.01
Channel X	- Input	-20000.15	1.22	-0.01
Channel Y	+ Input	199996.57	1.52	0.00
Channel Y	+ Input	20000.09	-2.36	-0.01
Channel Y	- Input	-20003.05	-1.65	0.01
Channel Z	+ Input	199995.51	0.44	0.00
Channel Z	+ Input	19999.49	-2.93	-0.01
Channel Z	- Input	-20003.45	-2.02	0.01

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2001.59	-0.18	-0.01
Channel X	+ Input	202.16	0.15	0.07
Channel X	- Input	-197.31	0.40	-0.20
Channel Y	+ Input	2001.43	-0.20	-0.01
Channel Y	+ Input	201.00	-0.84	-0.42
Channel Y	- Input	-198.62	-0.66	0.33
Channel Z	+ Input	2001.53	-0.06	-0.00
Channel Z	+ Input	200.32	-1.54	-0.76
Channel Z	- Input	-199.56	-1.57	0.79

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-3.92	-4.61
	- 200	7.37	4.65
Channel Y	200	-5.88	-7.43
	- 200	6.96	5.86
Channel Z	200	-23.77	-23.62
	- 200	21.74	21.52

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	2.98	-4.77
Channel Y	200	7.89	-	2.79
Channel Z	200	9.17	6.36	-

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	15996	17581
Channel Y	16150	16491
Channel Z	16130	15361

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.78	-0.03	1.52	0.32
Channel Y	-0.79	-1.76	0.77	0.41
Channel Z	-0.57	-1.39	0.58	0.37

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	–0.01	-8	-9

Appendix G – Phantom Calibration Data Sheets

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s p e a g

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info@speag.com, http://www.speag.com

Certificate of Conformity / First Article Inspection

Item	Oval Flat Phantom ELI 4.0
Type No	QD OVA 001 B
Series No	1003 and higher
Manufacturer	Untersee Composites Knebelstrasse 8 CH-8268 Mannenbach, Switzerland

Tests

Complete tests were made on the prototype units QD OVA 001 AA 1001, QD OVA 001 AB 1002, pre-series units QD OVA 001 BA 1003-1005 as well as on the series units QD OVA 001 BB, 1006 ff.

Test	Requirement	Details	Units tested
Material thickness	Compliant with the standard requirements	Bottom plate: 2.0mm +/- 0.2mm	all
Material parameters	Dielectric parameters for required frequencies	< 6 GHz: Rel. permittivity = 4 +/-1, Loss tangent ≤ 0.05	Material sample
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards if handled and cleaned according to the instructions.	DGBE based simulating liquids. Observe Technical Note for material compatibility.	Equivalent phantoms, Material sample
Shape	Thickness of bottom material, Internal dimensions, Sagging compatible with standards from minimum frequency	Bottom elliptical 600 x 400 mm Depth 190 mm, Shape is within tolerance for filling height up to 155 mm, Eventual sagging is reduced or eliminated by support via DUT	Prototypes, Sample testing

Standards

[1] CENELEC EN 50361-2001, « Basic standard for the measurement of the Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz – 3 GHz) », July 2001

[2] IEEE 1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques, December 2003

[3] IEC 62209 – 1, "Specific Absorption Rate (SAR) in the frequency range of 300 MHz to 3 GHz – Measurement Procedure, Part 1: Hand-held mobile wireless communication devices", February 2005

[4] IEC 62209 – 2, Draft, "Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices – Human models, Instrumentation and Procedures – Part 2: Procedure to determine the Specific Absorption Rate (SAR) in the head and body for 30 MHz to 6 GHz Handheld and Body-Mounted Devices used in close proximity to the Body.", February 2005

[5] OET Bulletin 65, Supplement C, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", Edition January 2001

Based on the tests above, we certify that this item is in compliance with the standards [1] to [5] if operated according to the specific requirements and considering the thickness. The dimensions are fully compliant with [4] from 30 MHz to 6 GHz. For the other standards, the minimum lower frequency limit is limited due to the dimensional requirements ([1]: 450 MHz, [2]: 300 MHz, [3]: 800 MHz, [5]: 375 MHz) and possibly further by the dimensions of the DUT.

Date 28.4.2008 **Signature / Stamp**

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Appendix H – Validation Summary

Per FCC KDB 865664 D02 v01r02, SAR system validation status should be documented to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles were used with the required tissue equivalent media for system validation according to the procedures outlined in FCC KDB 865664 D01 v01r04 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point was validated at a frequency within the valid frequency range of the probe calibration point using the system that normally operates with the probe for routine SAR measurements and according to the required tissue equivalent media.

A tabulated summary of the system validation status including the validation date(s), measurement frequencies, SAR probes and tissue dielectric parameters has been included.

Table H-1
SAR System Validation Summary

SAR System #	Freq. (MHz)	Date	Probe S/N	Probe Type	Probe Cal. Point		Cond. (σ)	Perm. (ε_r)	CW Validation			Modulation Validation		
									Sens-itivity	Probe Linearity	Probe Isotropy	Modulation Type	Duty Factor	PAR
3	750	02/20/2023	3662	EX3DV4	750	Head	0.90	41.67	Pass	Pass	Pass	QPSK	Pass	Pass
3	900	02/20/2023	3662	EX3DV4	900	Head	0.99	40.53	Pass	Pass	Pass	QPSK	Pass	Pass
3	1750	02/20/2023	3662	EX3DV4	1750	Head	1.40	39.21	Pass	Pass	Pass	QPSK	Pass	Pass
3	1900	02/21/2023	3662	EX3DV4	1900	Head	1.41	39.07	Pass	Pass	Pass	QPSK	Pass	Pass
3	2550	02/21/2023	3662	EX3DV4	2550	Head	1.94	38.25	Pass	Pass	Pass	QPSK	Pass	Pass
3	3700	2/08/2023	7530	EX3DV4	3700	Head	3.15	36.84	Pass	Pass	Pass	QPSK	Pass	Pass

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