RF Exposure Lab
802 N. Twin Oaks Valley Road, Suite 105 • San Marcos, CA 92069 • U.S.A.
TEL (760) 471-2100 • FAX (760) 471-2121
http://www.rfexposurelab.com

CERTIFICATE OF COMPLIANCE
SAR EVALUATION

Alcohol Monitoring Systems, Inc.	Dates of Test: December 28-30, 2021
1241 W. Mineral Ave., Suite 200	Test Report Number: SAR.20211208
Littleton, CO 80120	Revision B

FCC ID:	P8M-201910BG95M3
IC Certificate:	8549A-2019BG95M3
Model(s):	RB-150/RB-160
Test Sample:	Engineering Unit Same as Production
Serial No.:	Eng 1
Equipment Type:	Digital Transmission System Transceiver
Classification:	Portable Transmitter Next to Body
TX Frequency Range:	698 – 716 MHz; 777 – 787; 807 – 824; 814 – 849; 1710 – 1780 MHz; 1850 – 1915 MHz
Frequency Tolerance:	± 2.5 ppm
Maximum RF Output:	750 MHz (LTE) – 22.0 dBm, 850 MHz (LTE) – 22.0 dBm, 850 MHz (GPRS) – 33 dBm, 1750 MHz (LTE) – 22.0 dBm, 1900 MHz (LTE) – 22.0 dBm, 1900 MHz (GPRS) – 30 dBm Conducted
Signal Modulation:	QPSK, 16QAM, GMSK, 8PSK
Antenna Type:	Internal Antenna
Application Type:	Certification
FCC Rule Parts:	Part 2, 22, 24, 27, 90
KDB Test Methodology:	KDB 447498 D01 v06, KDB 941225 D05 v02r05, KDB 865664 D01 v01r04, KDB 865664 D02 v01r02
Industry Canada:	RSS-102 Issue 5, Safety Code 6
Max. Stand Alone SAR Value:	1.46 W/kg Reported
Separation Distance:	0 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 has been denied 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	December 30, 2021
Revision A – Correct IDs	January 24, 2022
Revision B – Correct ISED ID	January 24, 2022

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 Alcohol Monitoring Systems, Inc. Model RB150/RB-160 FCC ID: P8M-201910BG95M3 with FCC Part 2, 1093, ET Docket 93-62 Rules for mobile and portable devices and IC Certificate: 8549A-2019BG95M3 with RSS102 Issue 5 & Safety Code 6. The FCC have adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on August 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC regulated portable devices. [1], [6]

The test results recorded herein are based on a single type test of Alcohol Monitoring Systems, Inc. Model RB-150 and therefore apply only to the tested sample.

The two models are electrically and mechanically identical.

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 – 2003 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 RB-150/RB-160 Digital Transmission System Transceiver. The table also shows the tolerance for the power level for each mode.

Band	Technology	Rel.	Class	3GPP Nominal Power dBm	Setpoint Nominal Power dBm	Tolerance dBm	Lower Tolerance dBm	Upper Tolerance dBm
Band 2	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 4	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 5	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 12	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 13	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 25	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 26	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 27	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 66	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 85	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 2	GPRS	N/A	4	N/A	N/A	N/A	N/A	33.0
Band 5	GPRS	N/A	1	N/A	N/A	N/A	N/A	30.0

Note: LTE Bands B2, B4, B5 & B12 were not tested in this report. All four bands are fully within B25, B66, B26 & B85 respectively.

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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.

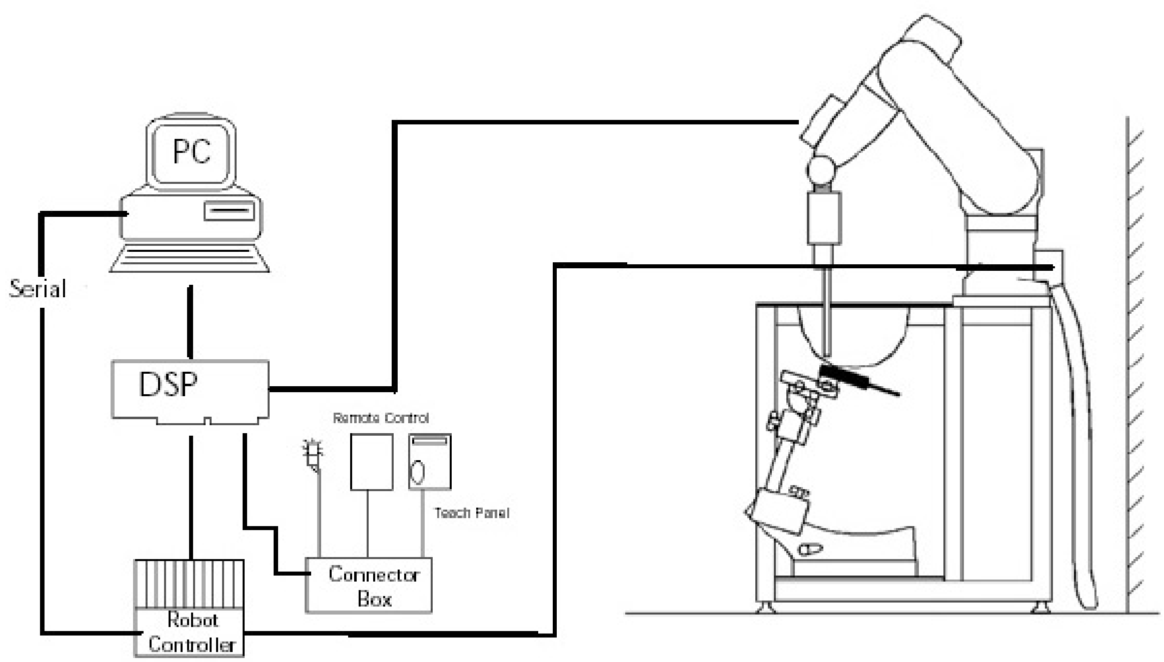

Figure 2.1 SAR Measurement System Setup

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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

Frequency: 10 MHz to 6 GHz

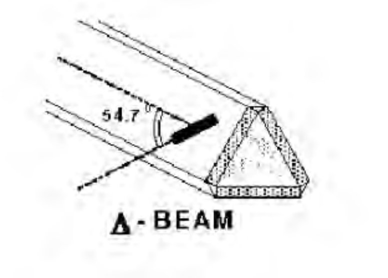

Figure 2.2 Triangular Probe Configurations

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;

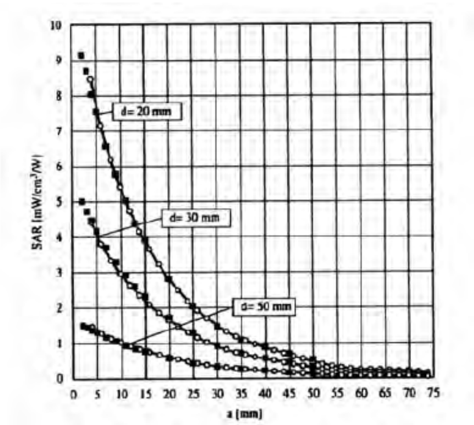

Figure 2.4 E-Field and Temperature Measurements at 900MHz

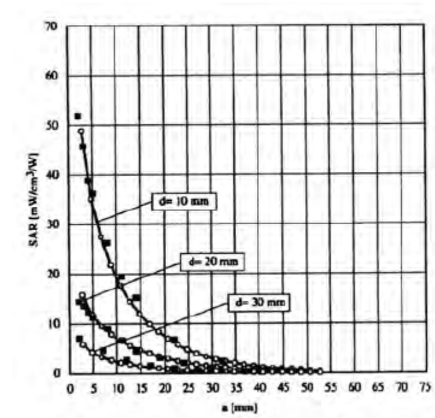

Figure 2.5 E-Field and Temperature Measurements at 1800MHz

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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.

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- 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

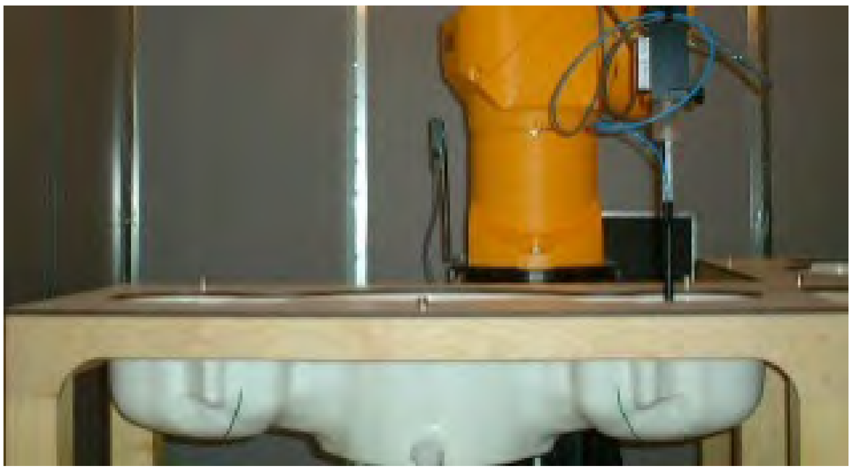

Figure 2.6 SAM Twin Phantom

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 and body mixtures 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. Body tissue parameters that have not been specified in IEEE1528-2013 are derived from the issue dielectric parameters computed from the 4-Cole-Cole equations.

Table 4.1 Typical Composition of Ingredients for Tissue

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

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5. ANSI/IEEE C95.1 – 1999 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] Brain	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 v01r04 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	
Date(s)		Dec. 30, 2021		Dec. 29, 2021	
Liquid Temperature (˚C)	20.0	Target	Measured	Target	Measured
Dielectric Constant: ε		41.94	41.60	41.50	41.55
Conductivity: σ		0.89	0.91	0.97	0.99
		1750 MHz Head		1900 MHz Head	
Date(s)		Dec. 28, 2021		Dec. 28, 2021	
Liquid Temperature (˚C)	20.0	Target	Measured	Target	Measured
Dielectric Constant: ε		40.08	39.55	40.00	39.81
Conductivity: σ		1.37	1.41	1.40	1.44

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 extrapolated 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
30-Dec-2021	750 MHz	8.57	8.65	Head	+ 0.93	1
29-Dec-2021	900 MHz	11.20	11.50	Head	+ 2.68	2
28-Dec-2021	1750 MHz	37.70	37.90	Head	+ 0.53	3
28-Dec-2021	1900 MHz	40.40	41.10	Head	+ 1.73	4

See Appendix A for data plots.

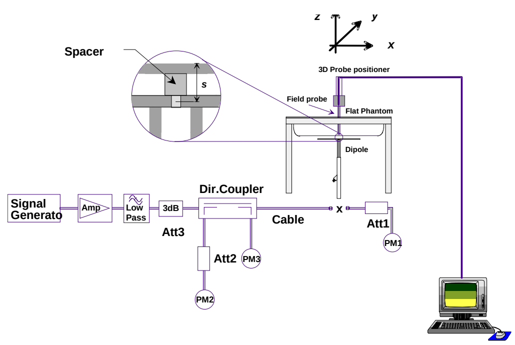

Figure 7.1 Dipole Validation Test Setup

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8. LTE Document Checklist

1) Identify the operating frequency range of each LTE transmission band used by the device

LTE Operating Band	Uplink (transmit) Low - high	Downlink (Receive) Low - high	Duplex mode (FDD/TDD)
2	1850-1910	1930-1990	FDD
4	1710-1755	2110-2155	FDD
5	824-849	869-894	FDD
12	699-716	729-746	FDD
13	777-787	746-756	FDD
25	1850-1915	1930-1995	FDD
26	814-849	859-894	FDD
27	807-824	852-869	FDD
66	1710-1780	2110-2200	FDD
85	698-716	728-746	FDD

2) Identify the channel bandwidths used in each frequency band; 1.4, 3, 5, 10, 15, 20 MHz etc

LTE Band Class	Bandwidth (MHz)	Frequency or Freq. Band (MHz)
2	1.4	1850-1910 MHz
4	1.4	1710-1755 MHz
5	1.4	824-849 MHz
12	1.4	699-716 MHz
13	1.4	777-787 MHz
25	1.4	1850-1915 MHz
26	1.4	814-849 MHz
27	1.4	807-824 MHz
66	1.4	1710-1780 MHz
85	1.4	698-716 MHz

3) Identify the high, middle and low (H, M, L) channel numbers and frequencies in each LTE frequency band

LTE Band Class	Bandwidth (MHz)	Frequency (MHz)/Channel #					
		Low		Mid		High	
2	1.4	1850.7	18607	1880.0	18900	1909.3	19193
4	1.4	1710.7	19957	1732.5	20175	1754.3	20393
5	1.4	824.7	20407	836.5	20525	848.3	20643
12	1.4	699.7	23017	707.5	23095	715.3	23173
13	1.4	777.7	23187	782.0	23230	786.3	23273
25	1.4	1850.7	26047	1882.5	26365	1914.3	26683
26	1.4	814.7	26697	831.5	26865	848.3	27033
27	1.4	807.7	27047	815.5	27125	823.3	27202
66	1.4	1710.7	131979	1745.0	132322	1779.3	132665
85	1.4	698.7	134009	707.0	134092	715.3	134174

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4) Specify the UE category and uplink modulations used:
   - UE Category: 5
   - Uplink modulations: QPSK and 16QAM

5) Include descriptions of the LTE transmitter and antenna implementation; and also identify whether it is a standalone transmitter operating independently of other wireless transmitters in the device or sharing hardware components and/or antenna(s) with other transmitters etc

   The device has 1 antenna:
   - WWAN Main (Transmit and Receive) Antenna

   Transmission relationship
   - All LTE transmission (TX) is limited to the WWAN antenna only

6) Identify the LTE voice/data requirements in each operating mode and exposure condition with respect to head and body test configurations, antenna locations, handset flip-cover or slide positions, antenna diversity conditions etc

   The device is a data only device. Data mode was tested in each operating mode and exposure condition in the body configuration. See test setup photos to see all configurations tested.

7) Include the maximum average conducted output power measured on the required test channels for each channel bandwidth and UL modulation used in each frequency band:

   The maximum average conducted output power measured for the testing is listed on pages 25-27 of this report. The below table shows the factory set point with the allowable tolerance.

Band	Technology	Rel.	Class	3GPP Nominal Power dBm	Setpoint Nominal Power dBm	Tolerance dBm	Lower Tolerance dBm	Upper Tolerance dBm
Band 2	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 4	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 5	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 12	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 13	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 25	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 26	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 27	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 66	LTE	13	5	21.0	21.0	±1.0	20.0	22.0
Band 85	LTE	13	5	21.0	21.0	±1.0	20.0	22.0

8) Identify all other U.S. wireless operating modes (3G, Wi-Fi, WiMax, Bluetooth etc), device/exposure configurations (head and body, antenna and handset flip-cover or slide positions, antenna diversity conditions etc.) and frequency bands used for these modes

   Other wireless modes:

Band	Technology	Rel.	Class	3GPP Nominal Power dBm	Setpoint Nominal Power dBm	Tolerance dBm	Lower Tolerance dBm	Upper Tolerance dBm
Band 2	GPRS	N/A	4	N/A	N/A	N/A	N/A	33.0
Band 5	GPRS	N/A	1	N/A	N/A	N/A	N/A	30.0

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9) Include the maximum average conducted output power measured for the other wireless modes and frequency bands.

   The maximum average conducted output power measured for the testing is listed on page 28 of this report. The below table shows the factory set point with the allowable tolerance.

10) Identify the simultaneous transmission conditions for the voice and data configurations supported by all wireless modes, device configurations and frequency bands, for the head and body exposure conditions and device operating configurations (handset flip or cover positions, antenna diversity conditions etc.)

    Not Applicable.

11) When power reduction is applied to certain wireless modes to satisfy SAR compliance for simultaneous transmission conditions, other equipment certification or operating requirements, include the maximum average conducted output power measured in each power reduction mode applicable to the simultaneous voice/data transmission configurations for such wireless configurations and frequency bands; and also include details of the power reduction implementation and measurement setup

    Power reduction is not required to satisfy SAR compliance.

12) Include descriptions of the test equipment, test software, built-in test firmware etc. required to support testing the device when power reduction is applied to one or more transmitters/antennas for simultaneous voice/data transmission

    Power reduction is not required to satisfy SAR compliance.

13) When appropriate, include a SAR test plan proposal with respect to the above

    Power reduction is not required to satisfy SAR compliance.

14) If applicable, include preliminary SAR test data and/or supporting information in laboratory testing inquiries to address specific issues and concerns or for requesting further test reduction considerations appropriate for the device; for example, simultaneous transmission configurations.

    Not applicable.

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9. 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 placed into simulated transmit mode using the manufacturer's test codes. Such test signals offer a consistent means for testing SAR and are recommended for evaluating SAR. When test modes are not available or inappropriate for testing a device, 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.

The EUT was tested on the back, left, right and bottom of the device. All measurements were conducted with the side of the device in direct contact with the phantom. The curvature of the device is 2.5 mm which is less than the 5 mm requirement in KDB447498 D01 v06 section 4.2.2 c) when the device is next to the body. All further test reductions are shown on pages 29-38 for LTE and page 39 for GPRS. See the photo in Appendix C for a pictorial of the setups.

The device was on a minimum of 10 cm of Styrofoam during each test.

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10.1 SAR Measurement Conditions for LTE Bands

10.1.1 LTE Functionality

The follow table identifies all the channel bandwidths in each frequency band supported by this device.

LTE Band Class	Bandwidth (MHz)	Frequency or Freq. Band (MHz)
2	1.4	1850-1910 MHz
4	1.4	1710-1755 MHz
5	1.4	824-849 MHz
12	1.4	699-716 MHz
13	1.4	777-787 MHz
25	1.4	1850-1915 MHz
26	1.4	814-849 MHz
27	1.4	807-824 MHz
66	1.4	1710-1780 MHz
85	1.4	698-716 MHz

10.1.2 Test Conditions

All SAR measurements for LTE were performed using the Rohde & Schwartz CMW500. A closed loop power control setting allowed the UE to transmit at the maximum output power during the SAR measurements. The Figure 10.2 table indicates all the test reduction utilized for this report.

MPR was enabled for this device. A-MPR was disabled for all SAR test measurements.

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Table 10.1 LTE Power Measurements

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
2	QPSK	1.4 MHz	6	0	18607	1850.7	21.1
					18900	1880.0	21.2
					19193	1909.3	21.2
	16QAM	1.4 MHz	6	0	18607	1850.7	20.2
					18900	1880.0	20.3
					19193	1909.3	20.4

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
4	QPSK	1.4 MHz	6	0	19957	1710.7	21.0
					20175	1732.5	21.1
					20393	1754.3	21.2
	16QAM	1.4 MHz	6	0	19957	1710.7	20.6
					20175	1732.5	20.4
					20393	1754.3	20.2

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
5	QPSK	1.4 MHz	6	0	20407	824.7	21.1
					20525	836.5	21.1
					20643	848.3	21.1
	16QAM	1.4 MHz	6	0	20407	824.7	20.3
					20525	836.5	20.4
					20643	848.3	20.2

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
12	QPSK	1.4 MHz	6	0	23017	699.7	21.0
					23095	707.5	21.0
					23173	715.3	21.0
	16QAM	1.4 MHz	6	0	23017	699.7	20.5
					23095	707.5	20.3
					23173	715.3	20.5

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Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
13	QPSK	1.4 MHz	6	0	23187	777.7	21.1
					23230	782.0	21.2
					23273	786.3	21.1
	16QAM	1.4 MHz	6	0	23187	777.7	20.6
					23230	782.0	20.0
					23273	786.3	20.5

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
25	QPSK	1.4 MHz	6	0	26047	1850.7	21.0
					26365	1882.5	21.0
					26683	1914.3	21.0
	16QAM	1.4 MHz	6	0	26047	1850.7	20.5
					26365	1882.5	20.0
					26683	1914.3	20.6

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
26	QPSK	1.4 MHz	6	0	26697	814.7	21.1
					26865	831.5	21.1
					27033	848.3	21.1
	16QAM	1.4 MHz	6	0	26697	814.7	20.5
					26865	831.5	20.5
					27033	848.3	20.5

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
27	QPSK	1.4 MHz	6	0	27047	807.7	21.3
					27125	815.5	21.4
					27202	823.3	21.2
	16QAM	1.4 MHz	6	0	27047	807.7	20.1
					27125	815.5	20.3
					27202	823.3	20.2

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Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
66	QPSK	1.4 MHz	6	0	131979	1710.7	21.7
					132322	1745.0	21.9
					132665	1779.3	21.8
	16QAM	1.4 MHz	6	0	131979	1710.7	20.3
					132322	1745.0	20.7
					132665	1779.3	20.8

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
85	QPSK	1.4 MHz	6	0	134009	698.7	21.7
					134092	707.0	21.8
					134174	715.3	21.6
	16QAM	1.4 MHz	6	0	134009	698.7	20.5
					134092	707.0	20.7
					134174	715.3	20.4

10.2 SAR Measurement Conditions for GSM

Configure the 8960 box to support GMSK and 8PSK call respectively, and set one timeslot and two timeslot transmission for GMSK GSM/GPRS and 8PSK EDGE. Measure and record power outputs for both modulations.

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GPRS-GMSK/1 slot			
Band	Channel	Peak Power	Frame Average
Cellular	128	32.70	23.67
	190	32.62	23.59
	251	32.55	23.52
PCS	512	29.04	20.01
	661	29.48	20.45
	810	29.96	20.93

GPRS-GMSK/2 slot			
Band	Channel	Peak Power	Frame Average
Cellular	128	29.22	23.20
	190	29.18	23.16
	251	29.07	23.05
PCS	512	25.47	19.45
	661	25.76	19.74
	810	26.10	20.08

GPRS-GMSK/3 slot			
Band	Channel	Peak Power	Frame Average
Cellular	128	27.33	23.07
	190	27.27	23.01
	251	27.16	22.90
PCS	512	23.27	19.01
	661	23.69	19.43
	810	24.39	20.13

GPRS-GMSK/4 slot			
Band	Channel	Peak Power	Frame Average
Cellular	128	25.82	22.81
	190	25.63	22.62
	251	24.49	21.48
PCS	512	22.10	19.09
	661	22.23	19.22
	810	22.65	19.64

EDGE-8PSK/1 slot			
Band	Channel	Peak Power	Frame Average
Cellular	128	25.96	16.93
	190	25.88	16.85
	251	25.80	16.77
PCS	512	24.63	15.60
	661	24.09	16.06
	810	25.50	16.47

EDGE-8PSK/2 slot			
Band	Channel	Peak Power	Frame Average
Cellular	128	22.85	16.83
	190	22.72	16.70
	251	22.65	16.63
PCS	512	22.45	16.43
	661	21.85	15.83
	810	22.30	16.28

EDGE-8PSK/3 slot			
Band	Channel	Peak Power	Frame Average
Cellular	128	21.61	17.35
	190	21.57	17.31
	251	21.51	17.25
PCS	512	19.84	15.58
	661	20.33	16.07
	810	20.76	16.50

EDGE-8PSK/4 slot			
Band	Channel	Peak Power	Frame Average
Cellular	128	20.45	17.44
	190	20.46	17.45
	251	20.43	17.42
PCS	512	18.56	15.55
	661	18.99	15.98
	810	19.50	16.49

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Table 10.1 Test Reduction Table – LTE

Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 2 1850-1910 MHz	Back	18607	1.4 MHz	QPSK	6	0	Reduced[1]
		18900					Reduced[1]
		19193					Reduced[1]
		18607		16QAM	6	0	Reduced[1]
		18900					Reduced[1]
		19193					Reduced[1]
	Front	18607	1.4 MHz	QPSK	6	0	Reduced[1]
		18900					Reduced[1]
		19193					Reduced[1]
		18607		16QAM	6	0	Reduced[1]
		18900					Reduced[1]
		19193					Reduced[1]
	Left	18607	1.4 MHz	QPSK	6	0	Reduced[1]
		18900					Reduced[1]
		19193					Reduced[1]
		18607		16QAM	6	0	Reduced[1]
		18900					Reduced[1]
		19193					Reduced[1]
	Right	18607	1.4 MHz	QPSK	6	0	Reduced[1]
		18900					Reduced[1]
		19193					Reduced[1]
		18607		16QAM	6	0	Reduced[1]
		18900					Reduced[1]
		19193					Reduced[1]
	Top	18607	1.4 MHz	QPSK	6	0	Reduced[1]
		18900					Reduced[1]
		19193					Reduced[1]
		18607		16QAM	6	0	Reduced[1]
		18900					Reduced[1]
		19193					Reduced[1]
	Bottom	18607	1.4 MHz	QPSK	6	0	Reduced[1]
		18900					Reduced[1]
		19193					Reduced[1]
		18607		16QAM	6	0	Reduced[1]
		18900					Reduced[1]
		19193					Reduced[1]

Reduced[1] – This band is fully within band 25. Therefore, it was not tested.

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Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 4 1710-1755 MHz	Back	19957	1.4 MHz	QPSK	6	0	Reduced[1]
		20175					Reduced[1]
		20393					Reduced[1]
		19957		16QAM	6	0	Reduced[1]
		20175					Reduced[1]
		20393					Reduced[1]
	Front	19957	1.4 MHz	QPSK	6	0	Reduced[1]
		20175					Reduced[1]
		20393					Reduced[1]
		19957		16QAM	6	0	Reduced[1]
		20175					Reduced[1]
		20393					Reduced[1]
	Left	19957	1.4 MHz	QPSK	6	0	Reduced[1]
		20175					Reduced[1]
		20393					Reduced[1]
		19957		16QAM	6	0	Reduced[1]
		20175					Reduced[1]
		20393					Reduced[1]
	Right	19957	1.4 MHz	QPSK	6	0	Reduced[1]
		20175					Reduced[1]
		20393					Reduced[1]
		19957		16QAM	6	0	Reduced[1]
		20175					Reduced[1]
		20393					Reduced[1]
	Top	19957	1.4 MHz	QPSK	6	0	Reduced[1]
		20175					Reduced[1]
		20393					Reduced[1]
		19957		16QAM	6	0	Reduced[1]
		20175					Reduced[1]
		20393					Reduced[1]
	Bottom	19957	1.4 MHz	QPSK	6	0	Reduced[1]
		20175					Reduced[1]
		20393					Reduced[1]
		19957		16QAM	6	0	Reduced[1]
		20175					Reduced[1]
		20393					Reduced[1]

Reduced[1] – This band is fully within band 66. Therefore, it was not tested.

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Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 5 824-849 MHz	Back	20407	1.4 MHz	QPSK	6	0	Reduced[1]
		20525					Reduced[1]
		20643					Reduced[1]
		20407		16QAM	6	0	Reduced[1]
		20525					Reduced[1]
		20643					Reduced[1]
	Front	20407	1.4 MHz	QPSK	6	0	Reduced[1]
		20525					Reduced[1]
		20643					Reduced[1]
		20407		16QAM	6	0	Reduced[1]
		20525					Reduced[1]
		20643					Reduced[1]
	Left	20407	1.4 MHz	QPSK	6	0	Reduced[1]
		20525					Reduced[1]
		20643					Reduced[1]
		20407		16QAM	6	0	Reduced[1]
		20525					Reduced[1]
		20643					Reduced[1]
	Right	20407	1.4 MHz	QPSK	6	0	Reduced[1]
		20525					Reduced[1]
		20643					Reduced[1]
		20407		16QAM	6	0	Reduced[1]
		20525					Reduced[1]
		20643					Reduced[1]
	Top	20407	1.4 MHz	QPSK	6	0	Reduced[1]
		20525					Reduced[1]
		20643					Reduced[1]
		20407		16QAM	6	0	Reduced[1]
		20525					Reduced[1]
		20643					Reduced[1]
	Bottom	20407	1.4 MHz	QPSK	6	0	Reduced[1]
		20525					Reduced[1]
		20643					Reduced[1]
		20407		16QAM	6	0	Reduced[1]
		20525					Reduced[1]
		20643					Reduced[1]

Reduced[1] – This band is fully within band 26. Therefore, it was not tested.

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Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 12 699-716 MHz	Back	23017	1.4 MHz	QPSK	6	0	Reduced[1]
		23095					Reduced[1]
		23173					Reduced[1]
		23017		16QAM	6	0	Reduced[1]
		23095					Reduced[1]
		23173					Reduced[1]
	Front	23017	1.4 MHz	QPSK	6	0	Reduced[1]
		23095					Reduced[1]
		23173					Reduced[1]
		23017		16QAM	6	0	Reduced[1]
		23095					Reduced[1]
		23173					Reduced[1]
	Left	23017	1.4 MHz	QPSK	6	0	Reduced[1]
		23095					Reduced[1]
		23173					Reduced[1]
		23017		16QAM	6	0	Reduced[1]
		23095					Reduced[1]
		23173					Reduced[1]
	Right	23017	1.4 MHz	QPSK	6	0	Reduced[1]
		23095					Reduced[1]
		23173					Reduced[1]
		23017		16QAM	6	0	Reduced[1]
		23095					Reduced[1]
		23173					Reduced[1]
	Top	23017	1.4 MHz	QPSK	6	0	Reduced[1]
		23095					Reduced[1]
		23173					Reduced[1]
		23017		16QAM	6	0	Reduced[1]
		23095					Reduced[1]
		23173					Reduced[1]
	Bottom	23017	1.4 MHz	QPSK	6	0	Reduced[1]
		23095					Reduced[1]
		23173					Reduced[1]
		23017		16QAM	6	0	Reduced[1]
		23095					Reduced[1]
		23173					Reduced[1]

Reduced[1] – This band is fully within band 85. Therefore, it was not tested.

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Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 13 777-787 MHz	Back	23187	1.4 MHz	QPSK	6	0	Reduced[1]
		23230					Tested
		23273					Reduced[1]
		23187		16QAM	6	0	Reduced[2]
		23230					Reduced[2]
		23273					Reduced[2]
	Front	23187	1.4 MHz	QPSK	6	0	Reduced[3]
		23230					Reduced[3]
		23273					Reduced[3]
		23187		16QAM	6	0	Reduced[3]
		23230					Reduced[3]
		23273					Reduced[3]
	Left	23187	1.4 MHz	QPSK	6	0	Reduced[1]
		23230					Tested
		23273					Reduced[1]
		23187		16QAM	6	0	Reduced[2]
		23230					Reduced[2]
		23273					Reduced[2]
	Right	23187	1.4 MHz	QPSK	6	0	Reduced[1]
		23230					Tested
		23273					Reduced[1]
		23187		16QAM	6	0	Reduced[2]
		23230					Reduced[2]
		23273					Reduced[2]
	Top	23187	1.4 MHz	QPSK	6	0	Reduced[3]
		23230					Reduced[3]
		23273					Reduced[3]
		23187		16QAM	6	0	Reduced[3]
		23230					Reduced[3]
		23273					Reduced[3]
	Bottom	23187	1.4 MHz	QPSK	6	0	Reduced[1]
		23230					Tested
		23273					Reduced[1]
		23187		16QAM	6	0	Reduced[2]
		23230					Reduced[2]
		23273					Reduced[2]

Reduced[1] – If the SAR value is less than 0.8 W/kg, the adjacent channels are reduced per KDB447498 D01 v06.
Reduced[2] – If the SAR value is less than 1.2 W/kg, 16QAM testing is reduced per KDB941225 D05 v02r05.
Reduced[3] – If the antenna is greater than 25 mm, this side is not required to be tested.

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Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 25 1850-1915 MHz	Back	26047	1.4 MHz	QPSK	6	0	Tested
		26365					Tested
		26683					Tested
		26047		16QAM	6	0	Reduced[2]
		26365					Reduced[2]
		26683					Reduced[2]
	Front	26047	1.4 MHz	QPSK	6	0	Reduced[3]
		26365					Reduced[3]
		26683					Reduced[3]
		26047		16QAM	6	0	Reduced[3]
		26365					Reduced[3]
		26683					Reduced[3]
	Left	26047	1.4 MHz	QPSK	6	0	Reduced[1]
		26365					Tested
		26683					Reduced[1]
		26047		16QAM	6	0	Reduced[2]
		26365					Reduced[2]
		26683					Reduced[2]
	Right	26047	1.4 MHz	QPSK	6	0	Reduced[1]
		26365					Tested
		26683					Reduced[1]
		26047		16QAM	6	0	Reduced[2]
		26365					Reduced[2]
		26683					Reduced[2]
	Top	26047	1.4 MHz	QPSK	6	0	Reduced[3]
		26365					Reduced[3]
		26683					Reduced[3]
		26047		16QAM	6	0	Reduced[3]
		26365					Reduced[3]
		26683					Reduced[3]
	Bottom	26047	1.4 MHz	QPSK	6	0	Reduced[1]
		26365					Tested
		26683					Reduced[1]
		26047		16QAM	6	0	Reduced[2]
		26365					Reduced[2]
		26683					Reduced[2]

Reduced[1] – If the SAR value is less than 0.8 W/kg, the adjacent channels are reduced per KDB447498 D01 v06.
Reduced[2] – If the SAR value is less than 1.2 W/kg, 16QAM testing is reduced per KDB941225 D05 v02r05.
Reduced[3] – If the antenna is greater than 25 mm, this side is not required to be tested.

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Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 26 814-849 MHz	Back	26697	1.4 MHz	QPSK	6	0	Reduced[1]
		26865					Tested
		27033					Reduced[1]
		26697		16QAM	6	0	Reduced[2]
		26865					Reduced[2]
		27033					Reduced[2]
	Front	26697	1.4 MHz	QPSK	6	0	Reduced[3]
		26865					Reduced[3]
		27033					Reduced[3]
		26697		16QAM	6	0	Reduced[3]
		26865					Reduced[3]
		27033					Reduced[3]
	Left	26697	1.4 MHz	QPSK	6	0	Reduced[1]
		26865					Tested
		27033					Reduced[1]
		26697		16QAM	6	0	Reduced[2]
		26865					Reduced[2]
		27033					Reduced[2]
	Right	26697	1.4 MHz	QPSK	6	0	Reduced[1]
		26865					Tested
		27033					Reduced[1]
		26697		16QAM	6	0	Reduced[2]
		26865					Reduced[2]
		27033					Reduced[2]
	Top	26697	1.4 MHz	QPSK	6	0	Reduced[3]
		26865					Reduced[3]
		27033					Reduced[3]
		26697		16QAM	6	0	Reduced[3]
		26865					Reduced[3]
		27033					Reduced[3]
	Bottom	26697	1.4 MHz	QPSK	6	0	Reduced[1]
		26865					Tested
		27033					Reduced[1]
		26697		16QAM	6	0	Reduced[2]
		26865					Reduced[2]
		27033					Reduced[2]

Reduced[1] – If the SAR value is less than 0.8 W/kg, the adjacent channels are reduced per KDB447498 D01 v06.
Reduced[2] – If the SAR value is less than 1.2 W/kg, 16QAM testing is reduced per KDB941225 D05 v02r05.
Reduced[3] – If the antenna is greater than 25 mm, this side is not required to be tested.

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Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 27 807-824 MHz	Back	27047	1.4 MHz	QPSK	6	0	Reduced[1]
		27125					Tested
		27202					Reduced[1]
		27047		16QAM	6	0	Reduced[2]
		27125					Reduced[2]
		27202					Reduced[2]
	Front	27047	1.4 MHz	QPSK	6	0	Reduced[3]
		27125					Reduced[3]
		27202					Reduced[3]
		27047		16QAM	6	0	Reduced[3]
		27125					Reduced[3]
		27202					Reduced[3]
	Left	27047	1.4 MHz	QPSK	6	0	Reduced[1]
		27125					Tested
		27202					Reduced[1]
		27047		16QAM	6	0	Reduced[2]
		27125					Reduced[2]
		27202					Reduced[2]
	Right	27047	1.4 MHz	QPSK	6	0	Reduced[1]
		27125					Tested
		27202					Reduced[1]
		27047		16QAM	6	0	Reduced[2]
		27125					Reduced[2]
		27202					Reduced[2]
	Top	27047	1.4 MHz	QPSK	6	0	Reduced[3]
		27125					Reduced[3]
		27202					Reduced[3]
		27047		16QAM	6	0	Reduced[3]
		27125					Reduced[3]
		27202					Reduced[3]
	Bottom	27047	1.4 MHz	QPSK	6	0	Reduced[1]
		27125					Tested
		27202					Reduced[1]
		27047		16QAM	6	0	Reduced[2]
		27125					Reduced[2]
		27202					Reduced[2]

Reduced[1] – If the SAR value is less than 0.8 W/kg, the adjacent channels are reduced per KDB447498 D01 v06.
Reduced[2] – If the SAR value is less than 1.2 W/kg, 16QAM testing is reduced per KDB941225 D05 v02r05.
Reduced[3] – If the antenna is greater than 25 mm, this side is not required to be tested.

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Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 66 1710-1780 MHz	Back	131979	1.4 MHz	QPSK	6	0	Tested
		132322					Tested
		132665					Tested
		131979		16QAM	6	0	Reduced[2]
		132322					Reduced[2]
		132665					Reduced[2]
	Front	131979	1.4 MHz	QPSK	6	0	Reduced[3]
		132322					Reduced[3]
		132665					Reduced[3]
		131979		16QAM	6	0	Reduced[3]
		132322					Reduced[3]
		132665					Reduced[3]
	Left	131979	1.4 MHz	QPSK	6	0	Reduced[1]
		132322					Tested
		132665					Reduced[1]
		131979		16QAM	6	0	Reduced[2]
		132322					Reduced[2]
		132665					Reduced[2]
	Right	131979	1.4 MHz	QPSK	6	0	Reduced[1]
		132322					Tested
		132665					Reduced[1]
		131979		16QAM	6	0	Reduced[2]
		132322					Reduced[2]
		132665					Reduced[2]
	Top	131979	1.4 MHz	QPSK	6	0	Reduced[3]
		132322					Reduced[3]
		132665					Reduced[3]
		131979		16QAM	6	0	Reduced[3]
		132322					Reduced[3]
		132665					Reduced[3]
	Bottom	131979	1.4 MHz	QPSK	6	0	Reduced[1]
		132322					Tested
		132665					Reduced[1]
		131979		16QAM	6	0	Reduced[2]
		132322					Reduced[2]
		132665					Reduced[2]

Reduced[1] – If the SAR value is less than 0.8 W/kg, the adjacent channels are reduced per KDB447498 D01 v06.
Reduced[2] – If the SAR value is less than 1.2 W/kg, 16QAM testing is reduced per KDB941225 D05 v02r05.
Reduced[3] – If the antenna is greater than 25 mm, this side is not required to be tested.

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Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 85 698-716 MHz	Back	134009	1.4 MHz	QPSK	6	0	Reduced[1]
		134092					Tested
		134174					Reduced[1]
		134009		16QAM	6	0	Reduced[2]
		134092					Reduced[2]
		134174					Reduced[2]
	Front	134009	1.4 MHz	QPSK	6	0	Reduced[3]
		134092					Reduced[3]
		134174					Reduced[3]
		134009		16QAM	6	0	Reduced[3]
		134092					Reduced[3]
		134174					Reduced[3]
	Left	134009	1.4 MHz	QPSK	6	0	Reduced[1]
		134092					Tested
		134174					Reduced[1]
		134009		16QAM	6	0	Reduced[2]
		134092					Reduced[2]
		134174					Reduced[2]
	Right	134009	1.4 MHz	QPSK	6	0	Reduced[1]
		134092					Tested
		134174					Reduced[1]
		134009		16QAM	6	0	Reduced[2]
		134092					Reduced[2]
		134174					Reduced[2]
	Top	134009	1.4 MHz	QPSK	6	0	Reduced[3]
		134092					Reduced[3]
		134174					Reduced[3]
		134009		16QAM	6	0	Reduced[3]
		134092					Reduced[3]
		134174					Reduced[3]
	Bottom	134009	1.4 MHz	QPSK	6	0	Reduced[1]
		134092					Tested
		134174					Reduced[1]
		134009		16QAM	6	0	Reduced[2]
		134092					Reduced[2]
		134174					Reduced[2]

Reduced[1] – If the SAR value is less than 0.8 W/kg, the adjacent channels are reduced per KDB447498 D01 v06.
Reduced[2] – If the SAR value is less than 1.2 W/kg, 16QAM testing is reduced per KDB941225 D05 v02r05.
Reduced[3] – If the antenna is greater than 25 mm, this side is not required to be tested.

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Band/ Frequency (MHz)	Technology	Side	Required Channel	Tested/ Reduced
Band 2 1850-1910 MHz	GPRS	Back	512	Tested
			661	Tested
			810	Tested
		Front	512	Reduced[2]
			661	Reduced[2]
			810	Reduced[2]
		Left	512	Reduced[1]
			661	Tested
			810	Reduced[1]
		Right	512	Reduced[1]
			661	Tested
			810	Reduced[1]
		Top	512	Reduced[2]
			661	Reduced[2]
			810	Reduced[2]
		Bottom	512	Reduced[1]
			661	Tested
			810	Reduced[1]
Band 5 824-849 MHz	GPRS	Back	128	Reduced[1]
			190	Tested
			251	Reduced[1]
		Front	128	Reduced[2]
			190	Reduced[2]
			251	Reduced[2]
		Left	128	Reduced[1]
			190	Tested
			251	Reduced[1]
		Right	128	Reduced[1]
			190	Tested
			251	Reduced[1]
		Top	128	Reduced[2]
			190	Reduced[2]
			251	Reduced[2]
		Bottom	128	Reduced[1]
			190	Tested
			251	Reduced[1]

Reduced[1] – If the SAR value is less than 0.8 W/kg, the adjacent channels are reduced per KDB447498 D01 v06.
Reduced[2] – If the antenna is greater than 25 mm, this side is not required to be tested.

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SAR Data Summary – 750 MHz Body – LTE Band 85

MEASUREMENT RESULTS											
Gap	Plot	Position	Frequency		BW/ Modulation	RB Size	RB Offset	MPR Target	End Power	Measured SAR (W/kg)	Reported SAR (W/kg)
			MHz	Ch.					(dBm)		
0 mm	1	Front	707.0	134092	1.4 MHz/QPSK	6	0	0	21.8	0.283	0.30
	-----	Left	707.0	134092	1.4 MHz/QPSK	6	0	0	21.8	0.150	0.16
	-----	Right	707.0	134092	1.4 MHz/QPSK	6	0	0	21.8	0.141	0.15
	-----	Bottom	707.0	134092	1.4 MHz/QPSK	6	0	0	21.8	0.269	0.28

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☐Test Code ☒Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

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SAR Data Summary – 750 MHz Body – LTE Band 13

MEASUREMENT RESULTS

Gap	Plot	Position	Frequency		BW/ Modulation	RB Size	RB Offset	MPR Target	End Power	Measured SAR (W/kg)	Reported SAR (W/kg)
			MHz	Ch.					(dBm)		
0 mm	2	Front	782.0	23230	1.4 MHz/QPSK	6	0	0	21.2	0.503	0.61
	-----	Left	782.0	23230	1.4 MHz/QPSK	6	0	0	21.2	0.206	0.25
	-----	Right	782.0	23230	1.4 MHz/QPSK	6	0	0	21.2	0.123	0.15
	-----	Bottom	782.0	23230	1.4 MHz/QPSK	6	0	0	21.2	0.457	0.55

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐ Left Head ☒ Eli4 ☐ Right Head
   SAR Configuration ☐ Head ☒ Body
2. Test Signal Call Mode ☐ Test Code ☒ Base Station Simulator
3. Test Configuration ☐ With Belt Clip ☐ Without Belt Clip ☒ N/A
4. Tissue Depth is at least 15.0 cm

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Vice President

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SAR Data Summary – 800 MHz Body – LTE Band 27

MEASUREMENT RESULTS

Gap	Plot	Position	Frequency		BW/ Modulation	RB Size	RB Offset	MPR Target	End Power	Measured SAR (W/kg)	Reported SAR (W/kg)
			MHz	Ch.					(dBm)		
0 mm	3	Front	815.5	27125	1.4 MHz/QPSK	6	0	0	21.4	0.460	0.53
	-----	Left	815.5	27125	1.4 MHz/QPSK	6	0	0	21.4	0.314	0.36
	-----	Right	815.5	27125	1.4 MHz/QPSK	6	0	0	21.4	0.117	0.13
	-----	Bottom	815.5	27125	1.4 MHz/QPSK	6	0	0	21.4	0.325	0.37

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☐Test Code ☒Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

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Vice President

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SAR Data Summary – 850 MHz Body – LTE Band 26

MEASUREMENT RESULTS

Gap	Plot	Position	Frequency		BW/ Modulation	RB Size	RB Offset	MPR Target	End Power	Measured SAR (W/kg)	Reported SAR (W/kg)
			MHz	Ch.					(dBm)		
0 mm	4	Front	831.5	26865	1.4 MHz/QPSK	6	0	0	21.1	0.459	0.57
	-----	Left	831.5	26865	1.4 MHz/QPSK	6	0	0	21.1	0.386	0.48
	-----	Right	831.5	26865	1.4 MHz/QPSK	6	0	0	21.1	0.138	0.17
	-----	Bottom	831.5	26865	1.4 MHz/QPSK	6	0	0	21.1	0.335	0.41

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐ Left Head ☒ Eli4 ☐ Right Head
   SAR Configuration ☐ Head ☒ Body
2. Test Signal Call Mode ☐ Test Code ☒ Base Station Simulator
3. Test Configuration ☐ With Belt Clip ☐ Without Belt Clip ☒ N/A
4. Tissue Depth is at least 15.0 cm

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Vice President

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SAR Data Summary – 850 MHz Body – GPRS Band 5

MEASUREMENT RESULTS								
Gap	**Plot**	**Position**	**Frequency**		**Modulation**	**End Power**	**Measured SAR (W/kg)**	**Reported SAR (W/kg)**
			MHz	**Ch.**		**(dBm)**		
0 mm	5	Front	831.5	26865	GMSK/1 Slot	32.70	0.362	0.39
	-----	Left	831.5	26865	GMSK/1 Slot	32.70	0.303	0.33
	-----	Right	831.5	26865	GMSK/1 Slot	32.70	0.121	0.13
	-----	Bottom	831.5	26865	GMSK/1 Slot	32.70	0.297	0.32

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☐Test Code ☒Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

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SAR Data Summary – 1750 MHz Body – LTE Band 66

MEASUREMENT RESULTS

Gap	Plot	Position	Frequency		BW/ Modulation	RB Size	RB Offset	MPR Target	End Power (dBm)	Measured SAR (W/kg)	Reported SAR (W/kg)
			MHz	Ch.							
0 mm	-----	Front	1710.7	131979	1.4 MHz/QPSK	6	0	0	21.7	1.16	1.24
	6		1745.0	132322	1.4 MHz/QPSK	6	0	0	21.9	1.35	1.38
	-----		1779.3	132665	1.4 MHz/QPSK	6	0	0	21.8	1.27	1.33
	-----	Left	1745.0	132322	1.4 MHz/QPSK	6	0	0	21.9	0.294	0.30
	-----	Right	1745.0	132322	1.4 MHz/QPSK	6	0	0	21.9	0.377	0.39
	-----	Bottom	1745.0	132322	1.4 MHz/QPSK	6	0	0	21.9	0.545	0.56
	-----	Repeat	1745.0	132322	1.4 MHz/QPSK	6	0	0	21.9	1.33	1.36

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐ Left Head ☒ Eli4 ☐ Right Head
   SAR Configuration ☐ Head ☒ Body
2. Test Signal Call Mode ☐ Test Code ☒ Base Station Simulator
3. Test Configuration ☐ With Belt Clip ☐ Without Belt Clip ☒ N/A
4. Tissue Depth is at least 15.0 cm

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SAR Data Summary – 1900 MHz Body – LTE Band 25

MEASUREMENT RESULTS											
Gap	**Plot**	**Position**	**Frequency**		**BW/ Modulation**	**RB Size**	**RB Offset**	**MPR Target**	**End Power**	**Measured SAR (W/kg)**	**Reported SAR (W/kg)**
			MHz	**Ch.**					**(dBm)**		
0 mm	7	Front	1850.7	26047	1.4 MHz/QPSK	6	0	0	21.5	1.30	1.46
	-----		1882.5	26365	1.4 MHz/QPSK	6	0	0	21.0	0.983	1.24
	-----		1914.3	26683	1.4 MHz/QPSK	6	0	0	21.0	0.759	0.96
	-----	Left	1882.5	26365	1.4 MHz/QPSK	6	0	0	21.0	0.273	0.34
	-----	Right	1882.5	26365	1.4 MHz/QPSK	6	0	0	21.0	0.468	0.59
	-----	Bottom	1882.5	26365	1.4 MHz/QPSK	6	0	0	21.0	0.331	0.42
	-----	Repeat	1850.7	26047	1.4 MHz/QPSK	6	0	0	21.5	1.28	1.44

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐ Left Head ☒ Eli4 ☐ Right Head
   SAR Configuration ☐ Head ☒ Body
2. Test Signal Call Mode ☐ Test Code ☒ Base Station Simulator
3. Test Configuration ☐ With Belt Clip ☐ Without Belt Clip ☒ N/A
4. Tissue Depth is at least 15.0 cm

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Vice President

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SAR Data Summary – 1900 MHz Body – GPRS Band 2

MEASUREMENT RESULTS

Gap	Plot	Position	Frequency		Modulation	End Power (dBm)	Measured SAR (W/kg)	Reported SAR (W/kg)
			MHz	Ch.				
0 mm	-----	Front	1850.2	512	GMSK/1 Slot	29.04	0.835	1.04
	8		1880.0	661	GMSK/1 Slot	29.48	0.926	1.04
	-----		1909.8	810	GMSK/1 Slot	29.96	0.913	0.92
	-----	Left	1880.0	661	GMSK/1 Slot	29.48	0.158	0.18
	-----	Right	1880.0	661	GMSK/1 Slot	29.48	0.367	0.41
	-----	Bottom	1880.0	661	GMSK/1 Slot	29.48	0.257	0.29
	-----	Repeat	1880.0	661	GMSK/1 Slot	29.48	0.911	1.03

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☐Test Code ☒Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

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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	1251
Device Holder	N/A	N/A	N/A
Data Acquisition Electronics 4	08/06/2022	08/06/2021	759
SPEAG E-Field Probe EX3DV4	02/23/2022	02/23/2021	3662
Speag Validation Dipole D750V3	06/04/2022	06/04/2021	1053
Speag Validation Dipole D900V2	06/04/2022	06/04/2021	1d128
Speag Validation Dipole D1750V2	06/03/2022	06/03/2021	1061
Speag Validation Dipole D1900V2	06/04/2022	06/04/2021	5d147
Agilent N1911A Power Meter	03/16/2022	03/16/2021	GB45100254
Agilent N1922A Power Sensor	03/17/2022	03/17/2021	MY45240464
Agilent (HP) 8561E Spectrum Analyzer	03/15/2022	03/15/2021	31720068
Agilent (HP) 8350B Signal Generator	03/16/2022	03/16/2021	2749A10226
Agilent (HP) 83525A RF Plug-In	03/16/2022	03/16/2021	2647A01172
Agilent (HP) 8753C Vector Network Analyzer	03/15/2022	03/15/2021	3135A01724
Agilent (HP) 85047A S-Parameter Test Set	03/15/2022	03/15/2021	2904A00595
Rohde & Schwartz CMW500 Call Box	05/27/2022	05/27/2021	1201.0002K50-127723-eE
MiniCircuits BW-N20W5+ Fixed 20 dB Attenuator	N/A	N/A	N/A
MiniCircuits SPL-10.7+ Low Pass Filter	N/A	N/A	R8979513746
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

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12. Conclusion

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the FCC/ISED. 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. [3]

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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 62209-1528 (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), 2020.

[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 Draft, Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), March 2014.

[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
Thu 30/Dec/2021
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
0.6900	42.22	0.89	41.92	0.87
0.6987	42.203	0.89	41.903	0.87*
0.7000	42.20	0.89	41.90	0.87
0.7070	42.165	0.89	41.851	0.877*
0.7100	42.15	0.89	41.83	0.88
0.7153	42.124	0.89	41.804	0.885*
0.7200	42.10	0.89	41.78	0.89
0.7300	42.05	0.89	41.71	0.90
0.7400	41.99	0.89	41.65	0.90
0.7500	41.94	0.89	41.60	0.91
0.7600	41.89	0.89	41.54	0.92
0.7700	41.84	0.89	41.48	0.93
0.7777	41.802	0.898	41.434	0.93*
0.7800	41.79	0.90	41.42	0.93
0.7820	41.778	0.90	41.408	0.932*
0.7863	41.752	0.90	41.382	0.936*
0.7900	41.73	0.90	41.36	0.94
0.8000	41.68	0.90	41.31	0.94

* value interpolated

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****
Test Result for UIM Dielectric Parameter
Wed 29/Dec/2021
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	41.30	0.93
0.8077	41.642	0.90	41.262	0.938*
0.8100	41.63	0.90	41.25	0.94
0.8147	41.607	0.90	41.222	0.945*
0.8155	41.603	0.90	41.217	0.946*
0.8200	41.58	0.90	41.19	0.95
0.8233	41.564	0.90	41.207	0.95*
0.8242	41.559	0.90	41.211	0.95*
0.8300	41.53	0.90	41.24	0.95
0.8315	41.526	0.902	41.236	0.952*
0.8366	41.51	0.907	41.22	0.957*
0.8400	41.50	0.91	41.21	0.96
0.8483	41.50	0.918	41.193	0.968*
0.8488	41.50	0.919	41.192	0.969*
0.8500	41.50	0.92	41.19	0.97
0.8600	41.50	0.93	41.17	0.98
0.8700	41.50	0.94	41.58	0.96
0.8800	41.50	0.95	41.57	0.97
0.8900	41.50	0.96	41.56	0.98
0.9000	41.50	0.97	41.55	0.99
0.9100	41.50	0.98	41.54	1.00
0.9200	41.49	0.98	41.53	1.00

* value interpolated

****
Test Result for UIM Dielectric Parameter
Tue 28/Dec/2021
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	39.65	1.37
1.7100	40.14	1.35	39.63	1.38
1.7107	40.139	1.35	39.629	1.381*
1.7200	40.13	1.35	39.61	1.39
1.7300	40.11	1.36	39.59	1.39
1.7400	40.09	1.37	39.57	1.40
1.7450	40.085	1.37	39.56	1.405*
1.7500	40.08	1.37	39.55	1.41
1.7600	40.06	1.38	39.53	1.42
1.7700	40.05	1.38	39.51	1.43
1.7793	40.031	1.389	39.491	1.43*
1.7800	40.03	1.39	39.49	1.43
1.7900	40.02	1.39	39.47	1.44

* value interpolated

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****
Test Result for UIM Dielectric Parameter
Tue 28/Dec/2021
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
1.8500	40.00	1.40	39.85	1.39
1.8502	40.00	1.40	39.85	1.39*
1.8507	40.00	1.40	39.921	1.319*
1.8600	40.00	1.40	39.84	1.40
1.8700	40.00	1.40	39.83	1.41
1.8800	40.00	1.40	39.82	1.42
1.8825	40.00	1.40	39.818	1.423*
1.8900	40.00	1.40	39.81	1.43
1.9000	40.00	1.40	39.81	1.44
1.9098	40.00	1.40	39.79	1.45*
1.9100	40.00	1.40	39.79	1.45
1.9143	40.00	1.40	39.781	1.45*
1.9200	40.00	1.40	39.77	1.45
1.9300	40.00	1.40	39.74	1.45

* value interpolated

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RF Exposure Lab

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 = 0.91 S/m; ε_r = 41.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

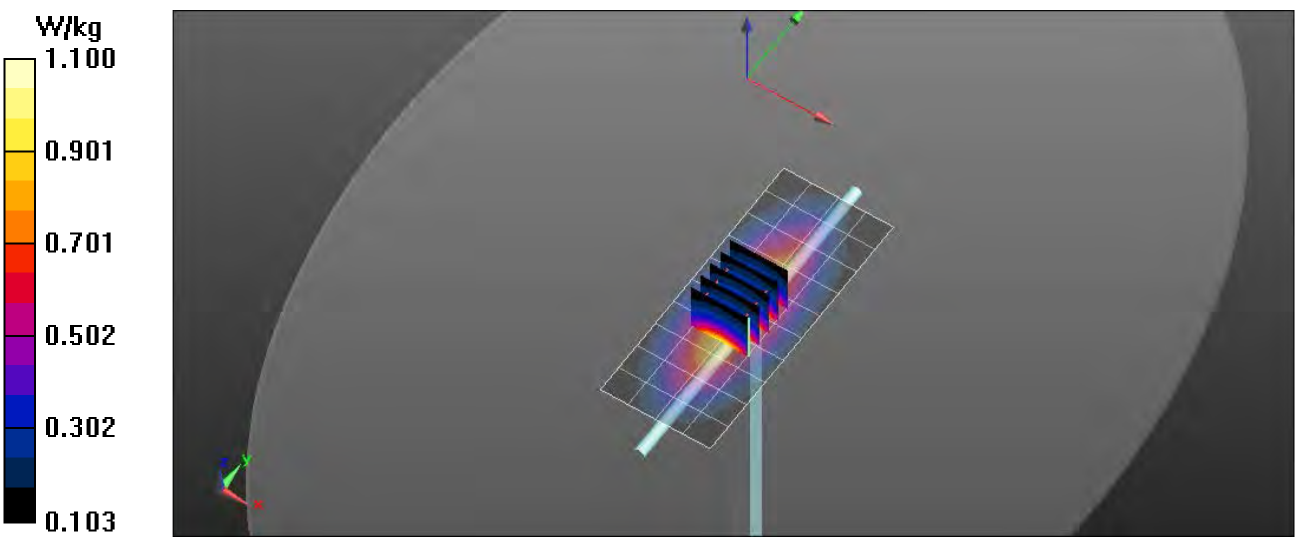
Test Date: Date: 12/30/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 – SN3662; ConvF(9.38, 9.38, 9.38); Calibrated: 2/23/2021;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/6/2021
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 1251
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 (measured) = 1.08 W/kg

750 MHz Head/Verification /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 31.227 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.30 W/kg
P_{in}= 100 mW
SAR(1 g) = 0.865 W/kg; SAR(10 g) = 0.549 W/kg
Maximum value of SAR (measured) = 1.10 W/kg



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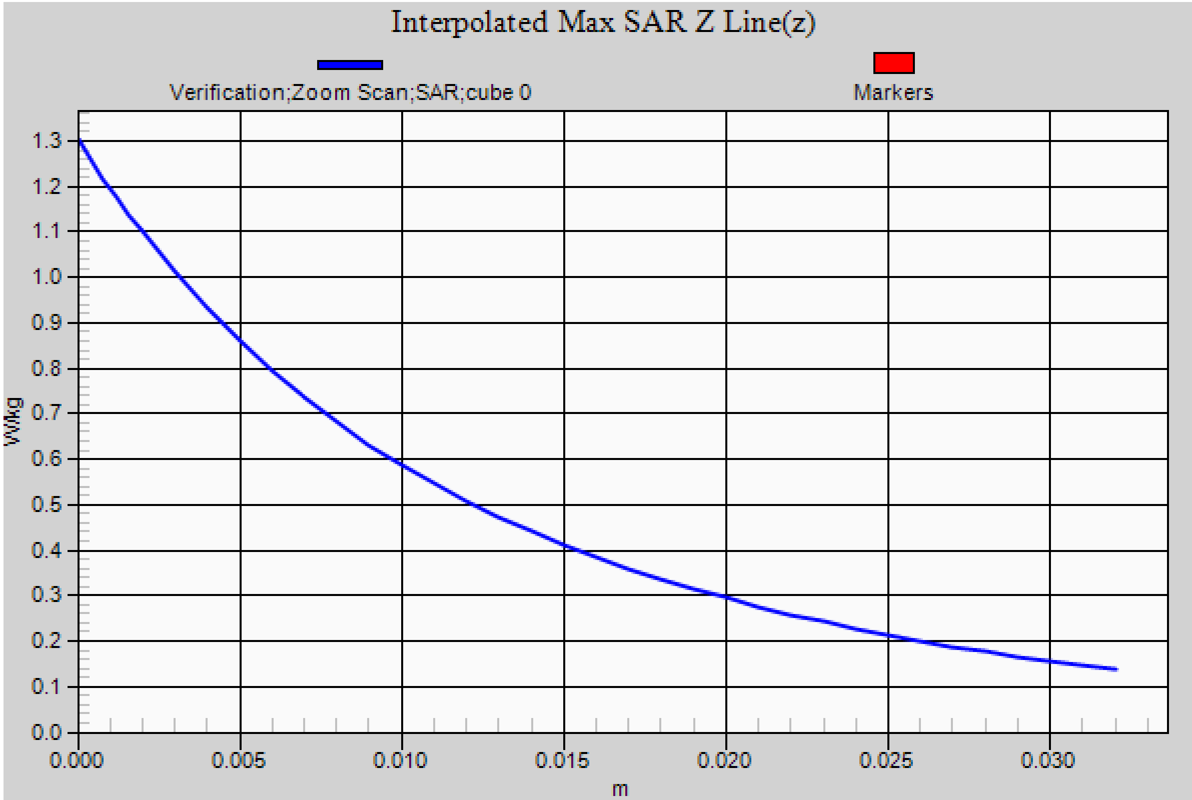

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RF Exposure Lab

Plot 2

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

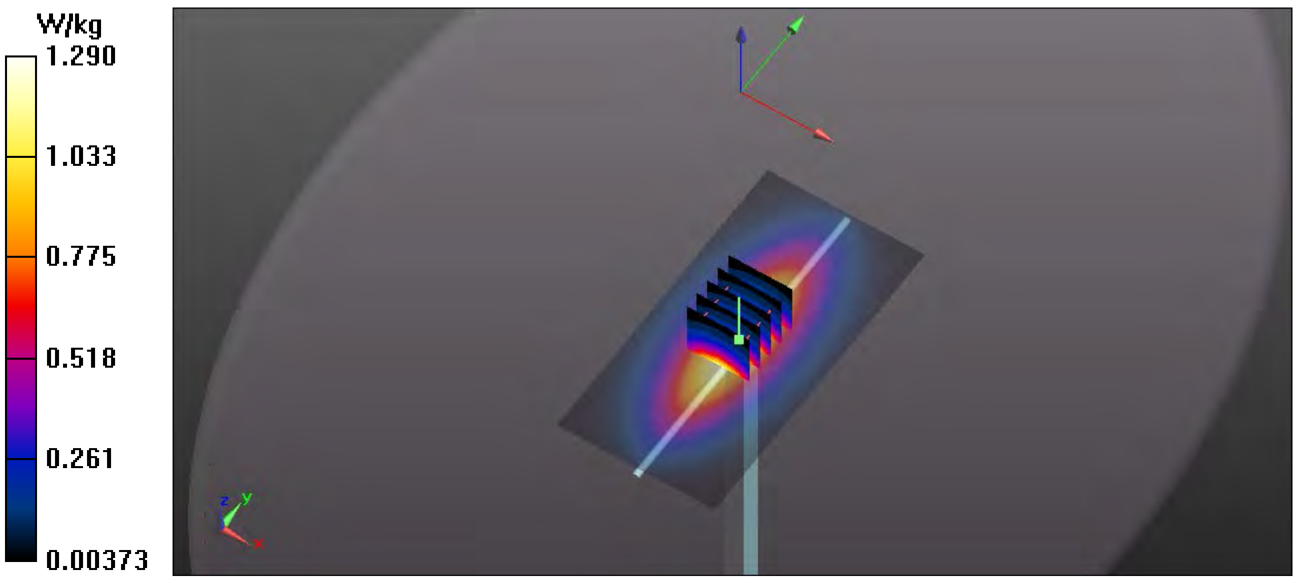
Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: HSL900; Medium parameters used: f = 900 MHz; σ = 0.99 mho/m; ε_r = 41.55; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 12/29/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 – SN3662; ConvF(8.85, 8.85, 8.85); Calibrated: 2/23/2021;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/6/2021
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 1251
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

Verification/900 MHz Head/Area Scan (41x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.29 W/kg

Verification/900 MHz Head/Zoom Scan (5x5x8)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 52.612 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.47 W/kg
P_{in}= 100 mW
SAR(1 g) = 1.15 W/kg; SAR(10 g) = 0.722 W/kg
Maximum value of SAR (measured) = 1.29 W/kg



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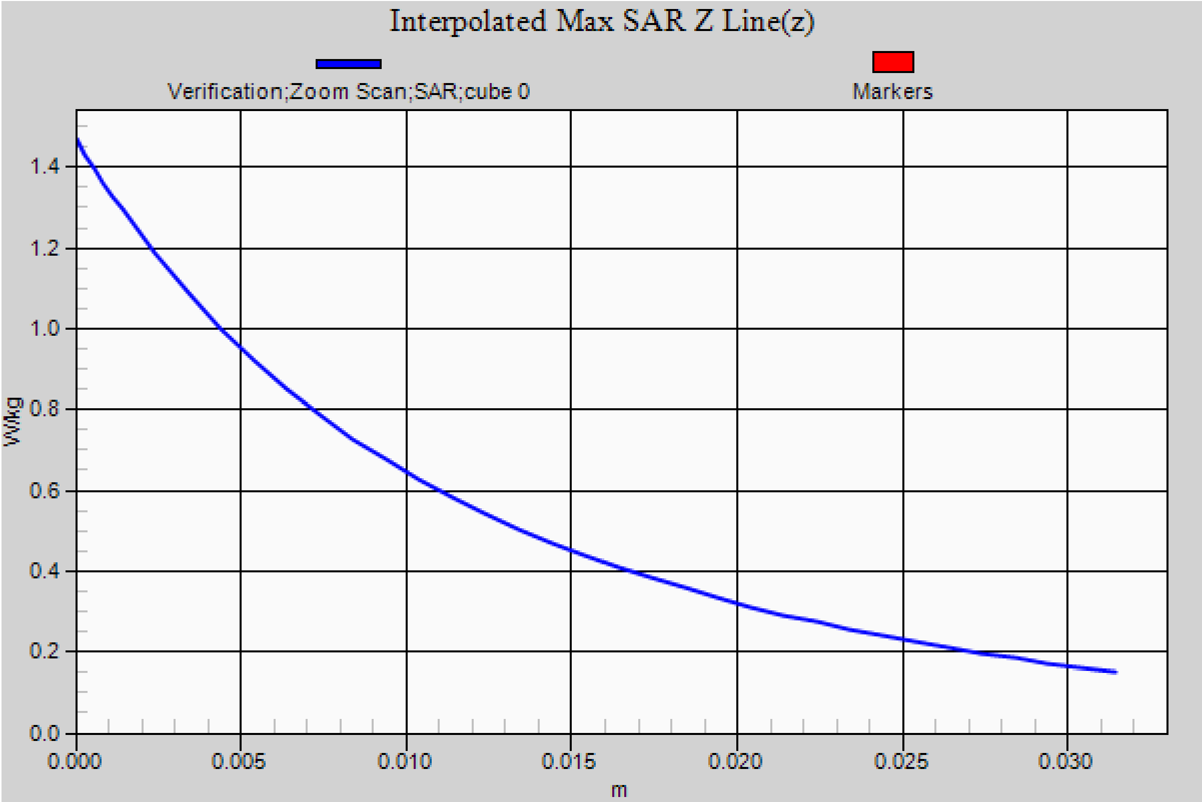

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Plot 3

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 = 1.41 S/m; ε_r = 39.55; ρ = 1000 kg/m^3
Phantom section: Flat Section

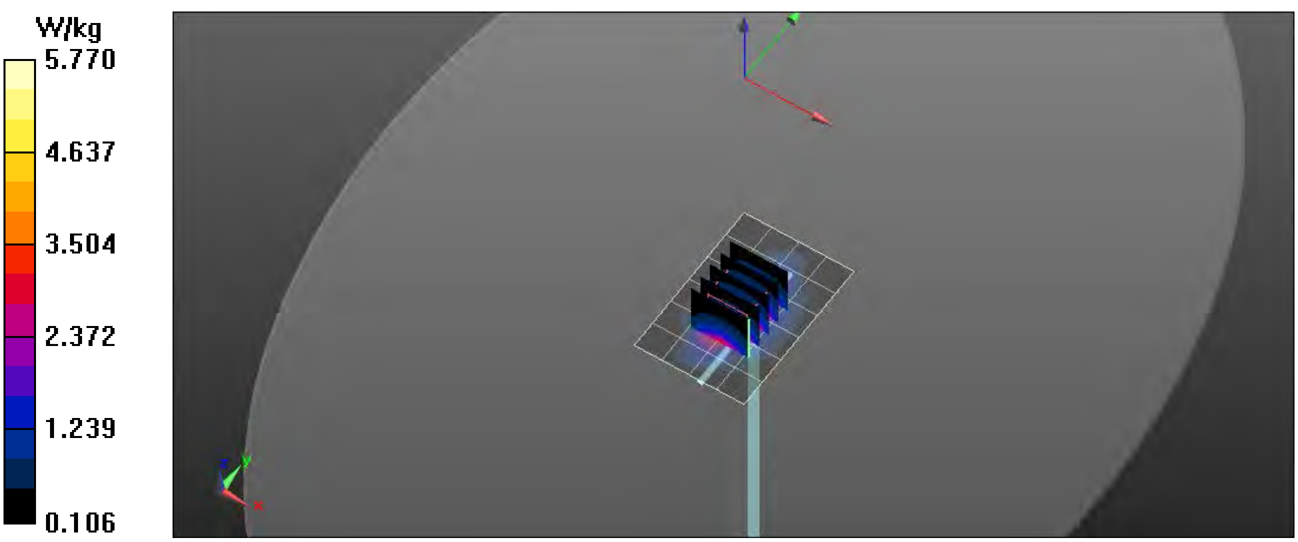
Test Date: Date: 12/28/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 – SN3662; ConvF(8.01, 8.01, 8.01); Calibrated: 2/23/2021;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/6/2021
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 1251
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

1750 MHz/Verification/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.46 W/kg

1750 MHz/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 32.568 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 6.92 W/kg
P_{in}= 100 mW
SAR(1 g) = 3.79 W/kg; SAR(10 g) = 1.96 W/kg
Maximum value of SAR (measured) = 5.47 W/kg



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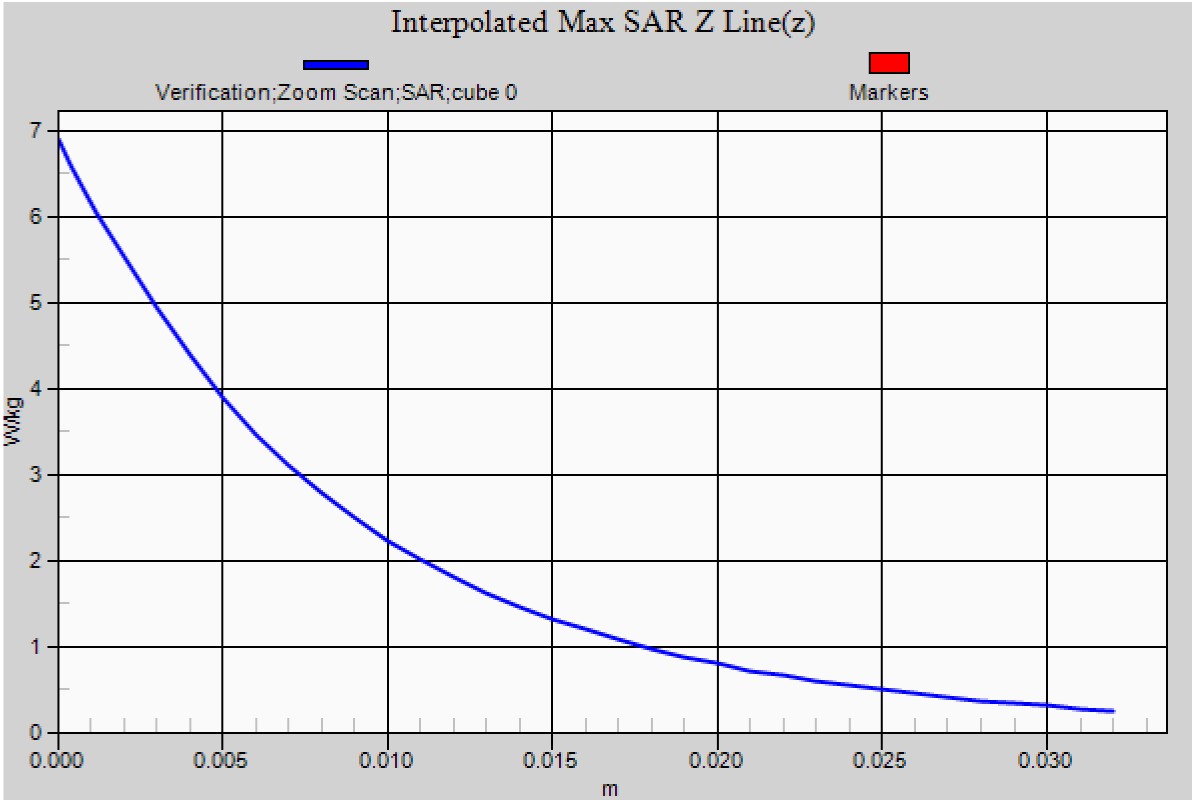

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Plot 4

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 = 1.44 S/m; ε_r = 39.81; ρ = 1000 kg/m^3
Phantom section: Flat Section

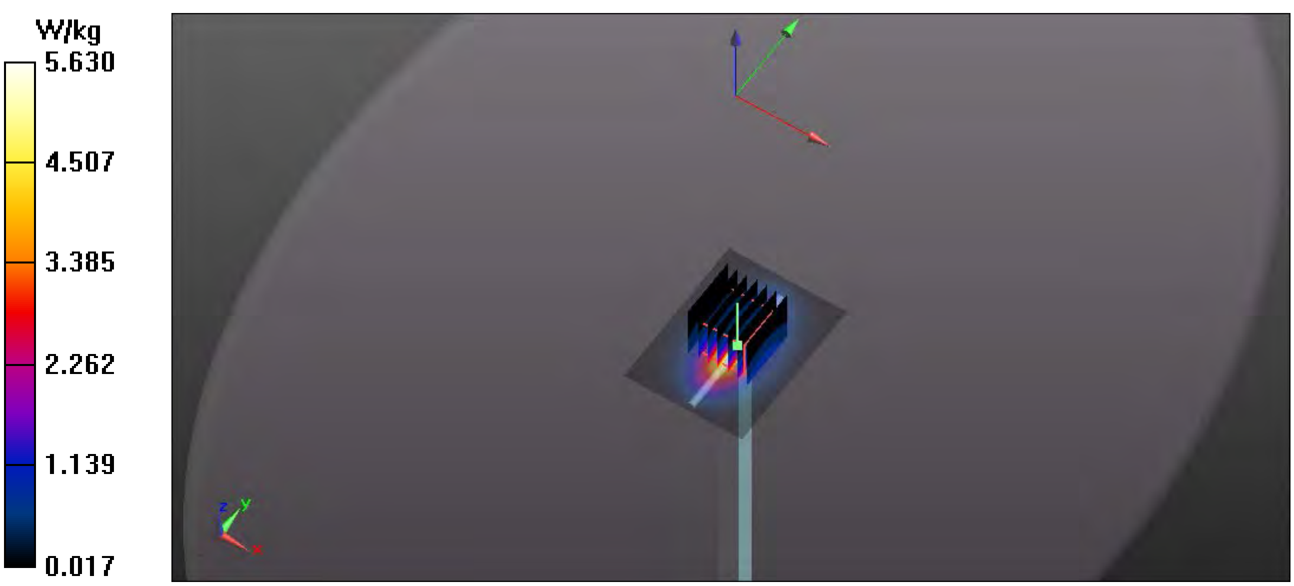
Test Date: Date: 12/28/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 – SN3662; ConvF(7.8, 7.8, 7.8); Calibrated: 2/23/2021;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/6/2021
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 1251
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

1900 MHz/Verification/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 5.63 W/kg

1900 MHz/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 52.612 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 6.68 W/kg
P_{in}= 100 mW
SAR(1 g) = 4.11 W/kg; SAR(10 g) = 2.12 W/kg
Maximum value of SAR (measured) = 5.63 W/kg



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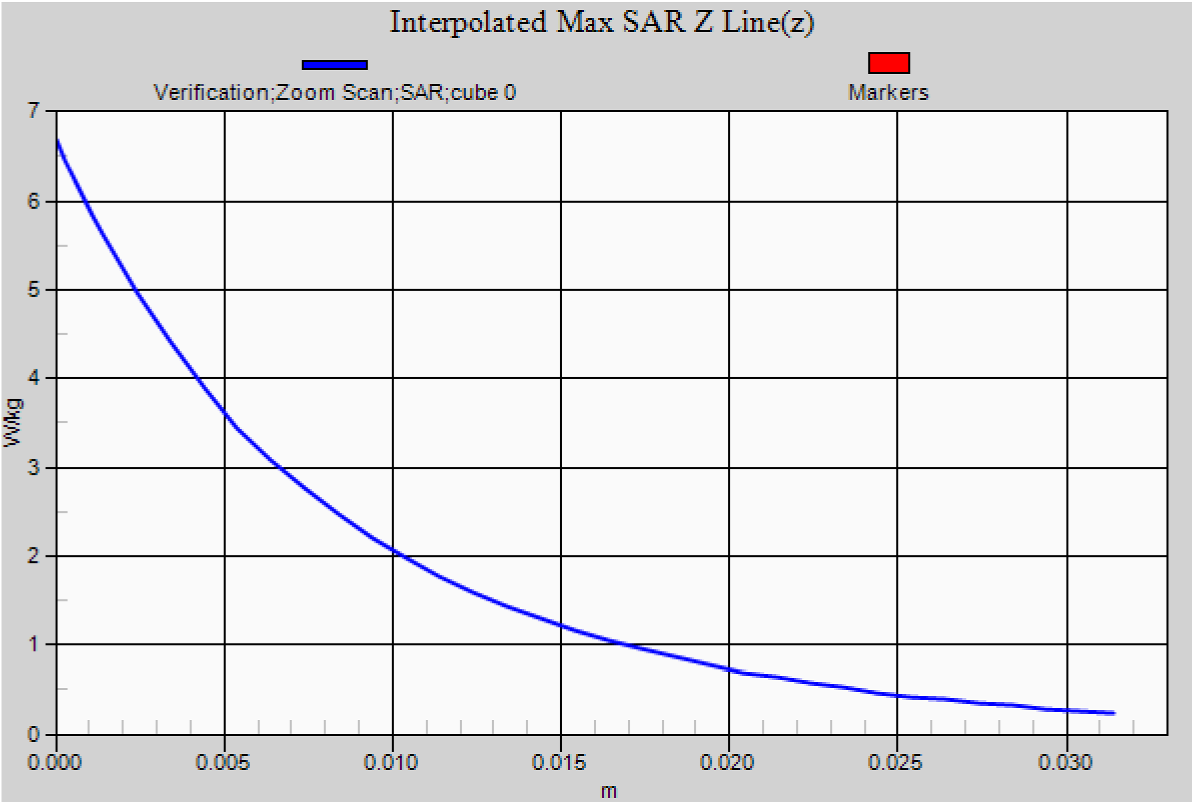

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Appendix B – SAR Test Data Plots

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RF Exposure Lab

Plot 1

DUT: Scram Remote Breath; Type: Alcohol Monitor; Serial: Eng 1

Communication System: LTE (SC-FDMA, 1 RB, 1.4 MHz, QPSK); Frequency: 707 MHz; Duty Cycle: 1:1
Medium: HSL750; Medium parameters used (interpolated): f = 707 MHz; σ = 0.877 S/m; ε_r = 41.851; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 12/30/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(9.38, 9.38, 9.38); Calibrated: 2/23/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/6/2021
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 1251
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

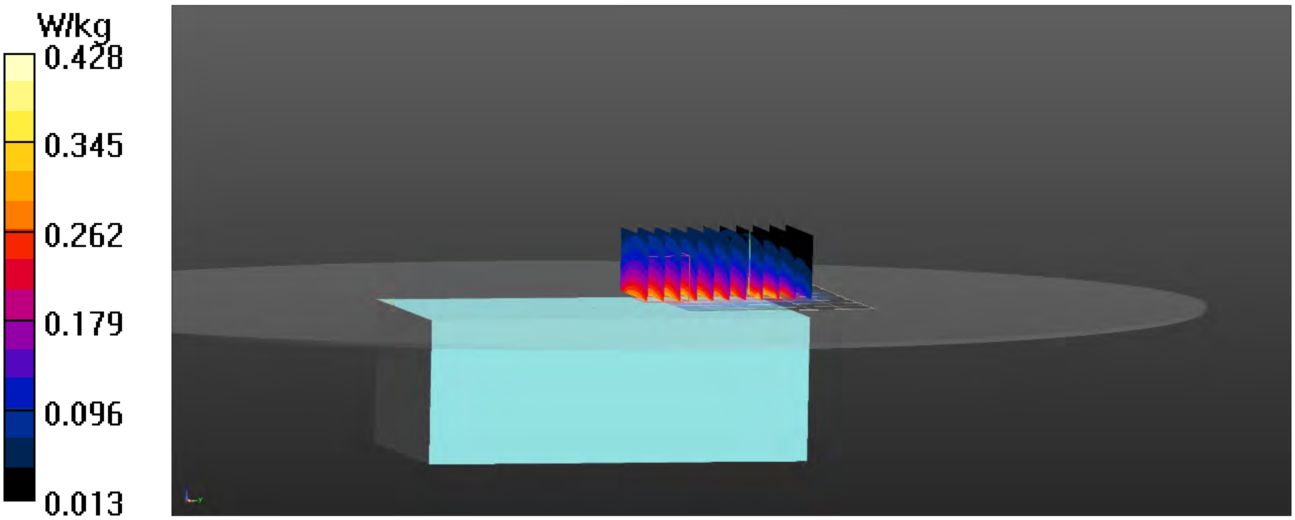
Procedure Notes:

B85 LTE/Back 6 RB 0 Offset Mid/Area Scan (9x7x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.316 W/kg

B85 LTE/Back 6 RB 0 Offset Mid/Zoom Scan (7x11x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.05 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.538 W/kg
SAR(1 g) = 0.283 W/kg; SAR(10 g) = 0.203 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.428 W/kg



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RF Exposure Lab

Plot 2

DUT: Scram Remote Breath; Type: Alcohol Monitor; Serial: Eng 1

Communication System: LTE (SC-FDMA, 1 RB, 1.4 MHz, QPSK); Frequency: 782 MHz; Duty Cycle: 1:1
Medium: HSL750; Medium parameters used (interpolated): f = 782 MHz; σ = 0.932 S/m; ε_r = 41.408; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 12/30/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(9.38, 9.38, 9.38); Calibrated: 2/23/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/6/2021
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 1251
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

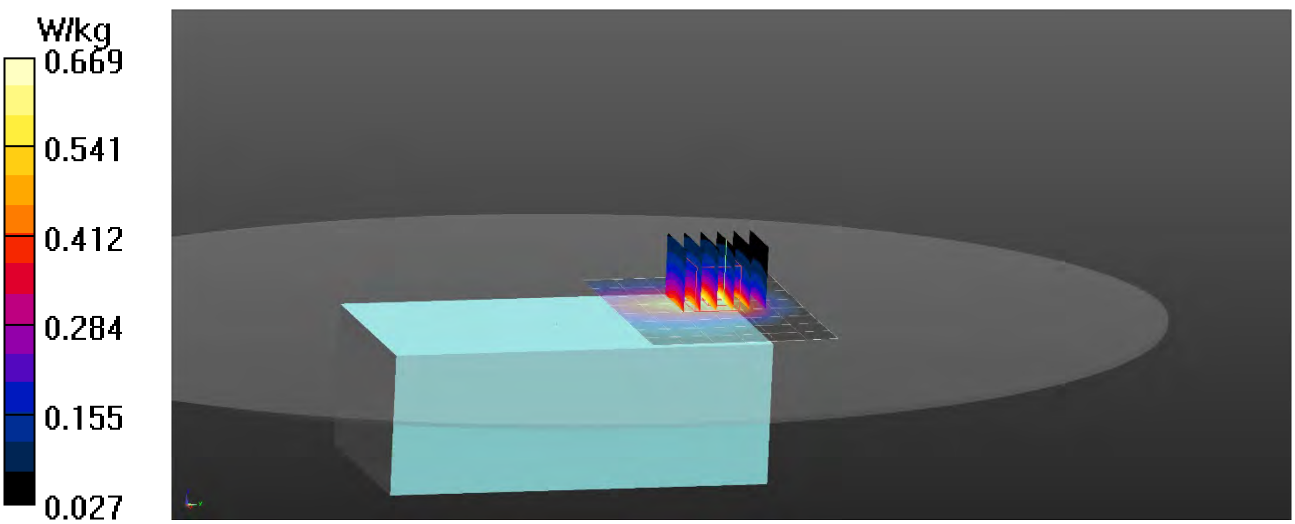
Procedure Notes:

B13 LTE/Back 6 RB 0 Offset Mid/Area Scan (9x7x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.577 W/kg

B13 LTE/Back 6 RB 0 Offset Mid/Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.18 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.842 W/kg
SAR(1 g) = 0.503 W/kg; SAR(10 g) = 0.321 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.669 W/kg



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RF Exposure Lab

Plot 3

DUT: Scram Remote Breath; Type: Alcohol Monitor; Serial: Eng 1

Communication System: LTE (SC-FDMA, 1 RB, 1.4 MHz, QPSK); Frequency: 815.5 MHz; Duty Cycle: 1:1
Medium: HSL835; Medium parameters used (interpolated): f = 815.5 MHz; σ = 0.946 S/m; ε_r = 41.217; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 12/29/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.85, 8.85, 8.85); Calibrated: 2/23/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/6/2021
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 1251
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

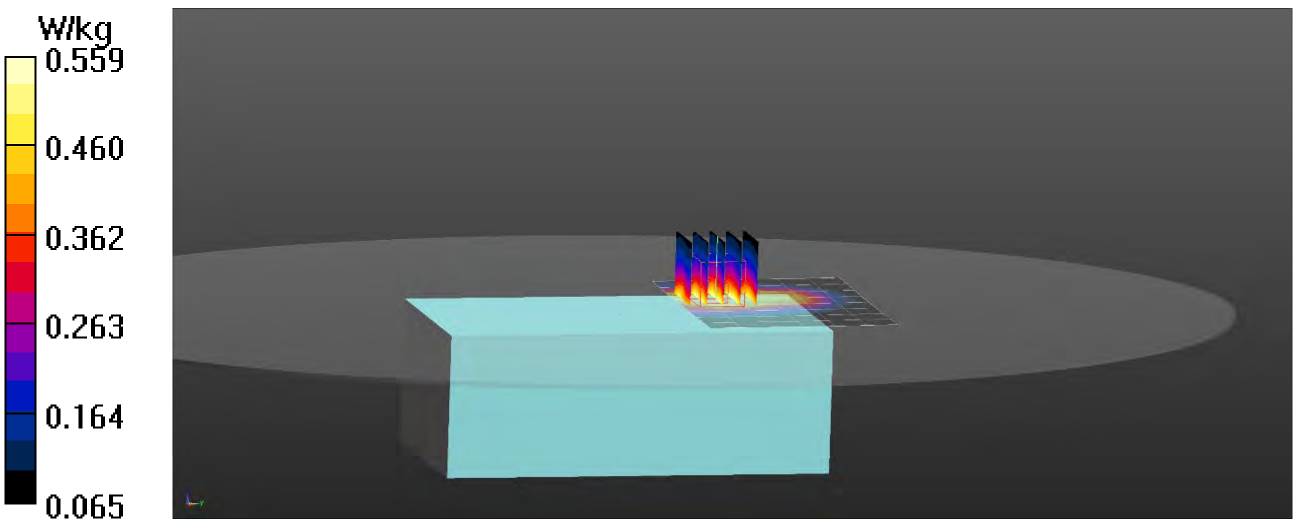
Procedure Notes:

B27 LTE/Back 6 RB 0 Offset Mid/Area Scan (9x7x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.570 W/kg

B27 LTE/Back 6 RB 0 Offset Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.14 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.653 W/kg
SAR(1 g) = 0.460 W/kg; SAR(10 g) = 0.341 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.559 W/kg



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Plot 4

DUT: Scram Remote Breath; Type: Alcohol Monitor; Serial: Eng 1

Communication System: LTE (SC-FDMA, 1 RB, 1.4 MHz, QPSK); Frequency: 831.5 MHz; Duty Cycle: 1:1
Medium: HSL835; Medium parameters used (interpolated): f = 831.5 MHz; σ = 0.952 S/m; ε_r = 41.236; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 12/29/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.85, 8.85, 8.85); Calibrated: 2/23/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/6/2021
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 1251
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

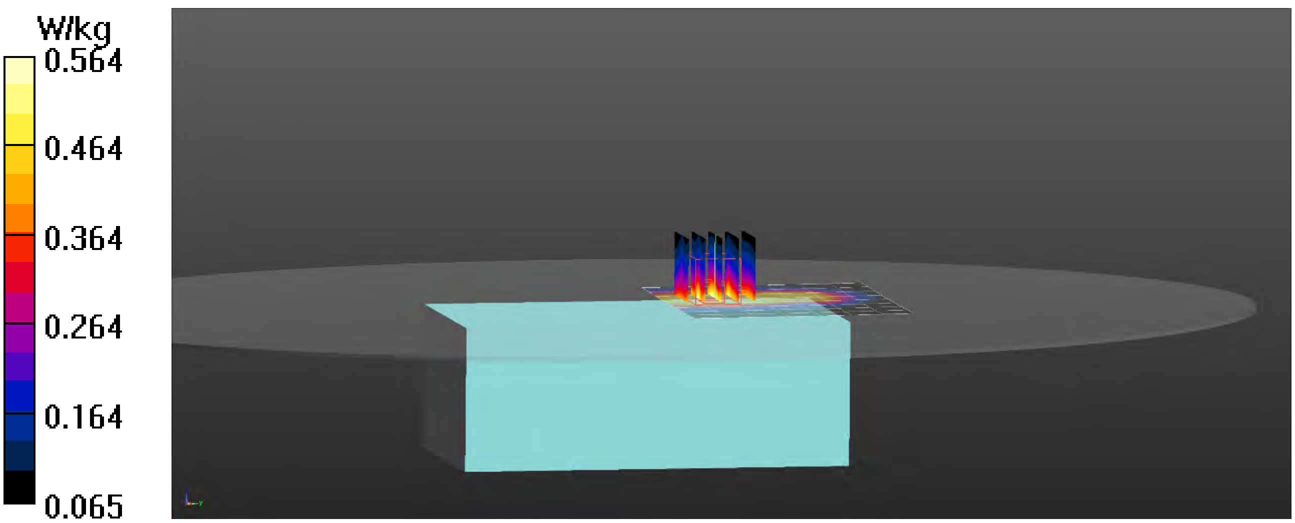
Procedure Notes:

B26 LTE/Back 6 RB 0 Offset Mid/Area Scan (9x8x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.574 W/kg

B26 LTE/Back 6 RB 0 Offset Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.52 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.656 W/kg
SAR(1 g) = 0.459 W/kg; SAR(10 g) = 0.314 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.564 W/kg



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Plot 5

DUT: Scram Remote Breath; Type: Alcohol Monitor; Serial: Eng 1

Communication System: QPSK (GMSK, 1 Slot); Frequency: 836.6 MHz; Duty Cycle: 1:8.00035
Medium: HSL835; Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.957 S/m; ε_r = 41.22; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 12/29/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.85, 8.85, 8.85); Calibrated: 2/23/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/6/2021
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 1251
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

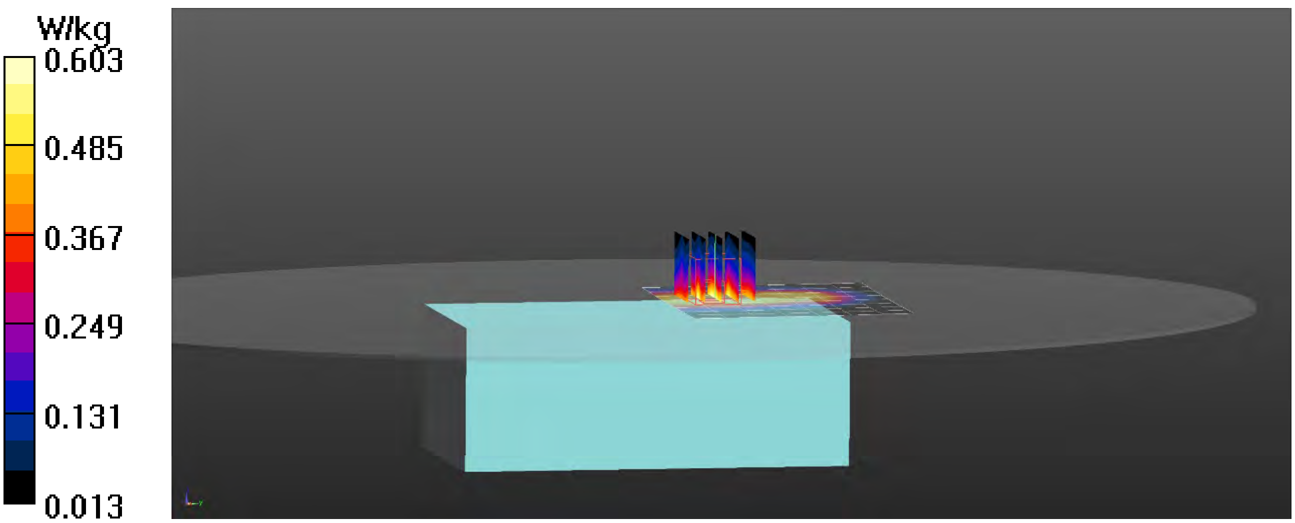
Procedure Notes:

B5 GSM/Left Mid/Area Scan (9x7x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.599 W/kg

B5 GSM/Left Mid/Zoom Scan (6x9x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.31 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.896 W/kg
SAR(1 g) = 0.362 W/kg; SAR(10 g) = 0.224 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.603 W/kg



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Plot 6

DUT: Scram Remote Breath; Type: Alcohol Monitor; Serial: Eng 1

Communication System: LTE (SC-FDMA, 1 RB, 1.4 MHz, QPSK); Frequency: 1745 MHz; Duty Cycle: 1:1
Medium: HSL1750; Medium parameters used (interpolated): f = 1745 MHz; σ = 1.405 S/m; ε_r = 39.56; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 12/28/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.01, 8.01, 8.01); Calibrated: 2/23/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/6/2021
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 1251
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

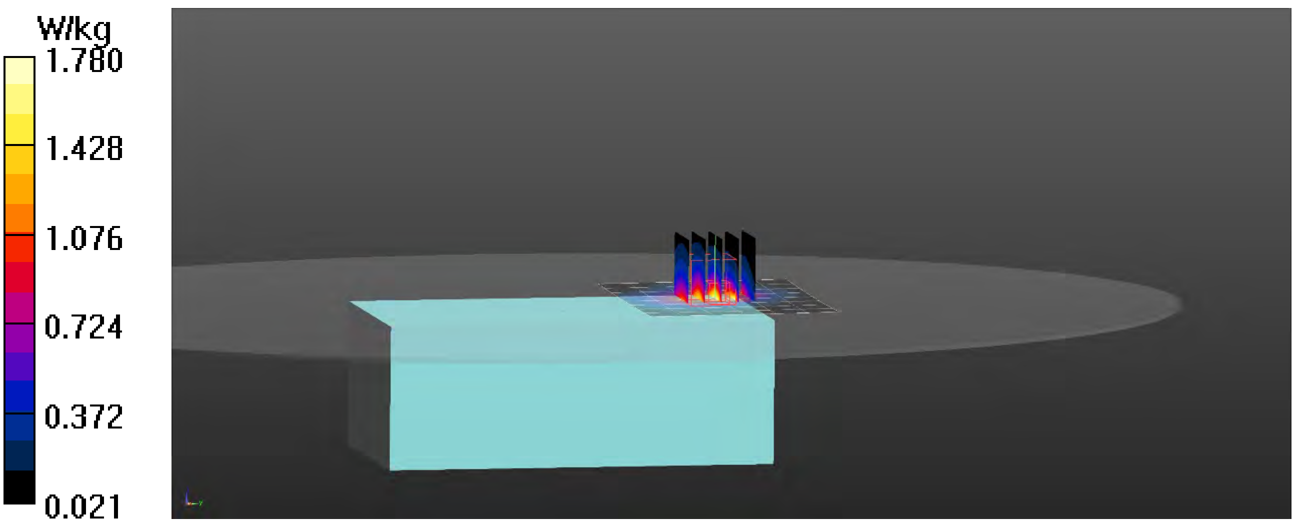
Procedure Notes:

B66 LTE/Back 6 RB 0 Offset Mid/Area Scan (9x7x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.89 W/kg

B66 LTE/Back 6 RB 0 Offset Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.621 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 2.85 W/kg
SAR(1 g) = 1.35 W/kg; SAR(10 g) = 0.752 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.78 W/kg



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Plot 7

DUT: Scram Remote Breath; Type: Alcohol Monitor; Serial: Eng 1

Communication System: LTE (SC-FDMA, 1 RB, 1.4 MHz, QPSK); Frequency: 1850.7 MHz; Duty Cycle: 1:1
Medium: HSL1900; Medium parameters used (interpolated): f = 1850.7 MHz; σ = 1.319 S/m; ε_r = 39.921; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 12/28/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(7.8, 7.8, 7.8); Calibrated: 2/23/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/6/2021
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 1251
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

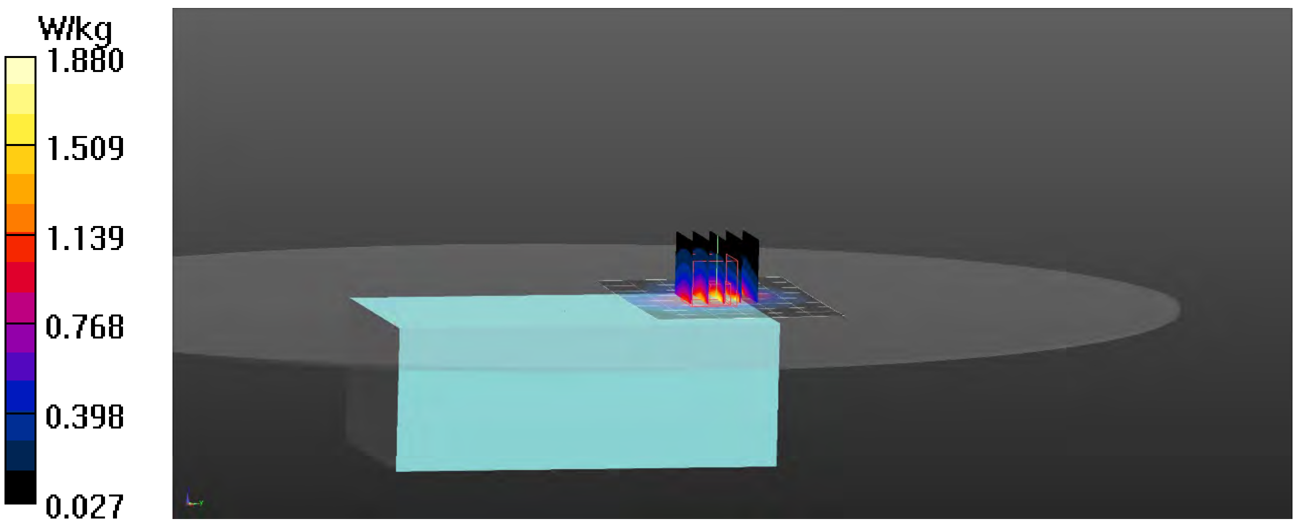
Procedure Notes:

B25 LTE/Back 6 RB 0 Offset Low/Area Scan (9x7x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.86 W/kg

B25 LTE/Back 6 RB 0 Offset Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.346 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 2.93 W/kg
SAR(1 g) = 1.3 W/kg; SAR(10 g) = 0.717 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.88 W/kg



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Plot 8

DUT: Scram Remote Breath; Type: Alcohol Monitor; Serial: Eng 1

Communication System: QPSK (GMSK, 1 Slot); Frequency: 1880 MHz; Duty Cycle: 1:8.00035
Medium: HSL1900; Medium parameters used: f = 1880 MHz; $\sigma = 1.42$ S/m; $\varepsilon_r = 39.82$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section

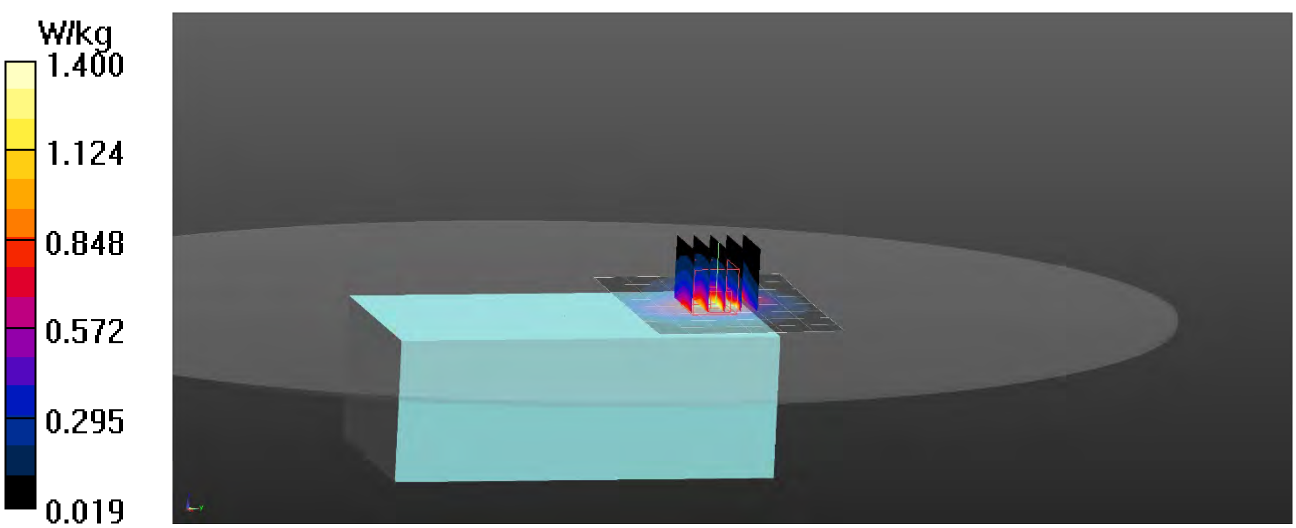
Test Date: Date: 12/28/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(7.8, 7.8, 7.8); Calibrated: 2/23/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/6/2021
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: 1251
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

B2 GSM/Back Mid/Area Scan (9x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.39 W/kg

B2 GSM/Back Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.577 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 2.17 W/kg
SAR(1 g) = 0.926 W/kg; SAR(10 g) = 0.529 W/kg
Maximum value of SAR (measured) = 1.40 W/kg



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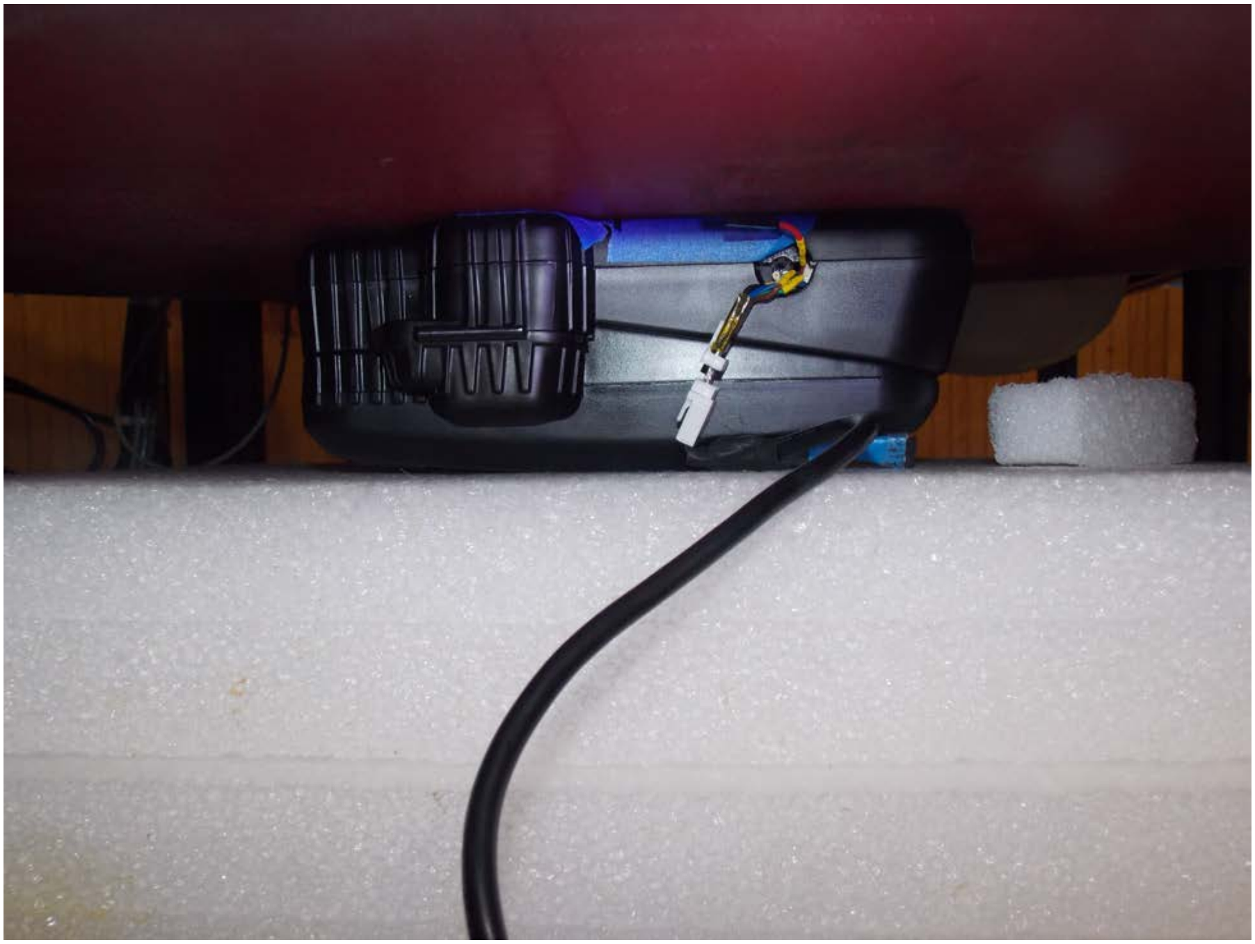
Appendix C – SAR Test Setup Photos



Test Position Back 0 mm Gap

Note: Cable removed prior to testing.

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Test Position Left 0 mm Gap

Note: Cable removed prior to testing.

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Test Position Right 0 mm Gap

Note: Cable removed prior to testing.

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Test Position Bottom 0 mm Gap

Note: Cable removed prior to testing.

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Front of Device

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Back of Device

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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**
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: EX3-3662_Feb21

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3662
Calibration procedure(s)	QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v6, QA CAL-23.v5, QA CAL-25.v7 Calibration procedure for dosimetric E-field probes
Calibration date:	February 23, 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	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: CC2552 (20x)	31-Mar-20 (No. 217-03106)	Apr-21
DAE4	SN: 660	23-Dec-20 (No. DAE4-660_Dec20)	Dec-21
Reference Probe ES3DV2	SN: 3013	30-Dec-20 (No. ES3-3013_Dec20)	Dec-21
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-20)	In house check: Jun-22
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 23, 2021

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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) IEEE Std 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, June 2013
b) IEC 62209-1, ", “Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, “SAR Measurement Requirements for 100 MHz to 6 GHz”

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ (f ≤ 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 (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; 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 ≤ 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).

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3662

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.41	0.49	0.47	± 10.1 %
DCP (mV)[B]	101.7	102.5	97.2	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Max dev.	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	182.7	± 3.8 %	± 4.7 %
		Y	0.0	0.0	1.0		183.4		
		Z	0.0	0.0	1.0		183.4		

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 Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3662

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-95.9
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.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3662

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	52.3	0.76	11.63	11.63	11.63	0.00	1.00	± 13.3 %
220	49.0	0.81	11.51	11.51	11.51	0.00	1.00	± 13.3 %
300	45.3	0.87	11.30	11.30	11.30	0.08	1.20	± 13.3 %
450	43.5	0.87	10.89	10.89	10.89	0.15	1.20	± 13.3 %
750	41.9	0.89	9.38	9.38	9.38	0.53	0.80	± 12.0 %
900	41.5	0.97	8.85	8.85	8.85	0.46	0.80	± 12.0 %
1750	40.1	1.37	8.01	8.01	8.01	0.32	0.85	± 12.0 %
1900	40.0	1.40	7.80	7.80	7.80	0.29	0.85	± 12.0 %
2300	39.5	1.67	7.66	7.66	7.66	0.26	0.90	± 12.0 %
2450	39.2	1.80	7.40	7.40	7.40	0.37	0.90	± 12.0 %
2600	39.0	1.96	7.20	7.20	7.20	0.36	0.90	± 12.0 %
3500	37.9	2.91	6.78	6.78	6.78	0.35	1.30	± 13.1 %
3700	37.7	3.12	6.63	6.63	6.63	0.35	1.30	± 13.1 %
5250	35.9	4.71	5.05	5.05	5.05	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.75	4.75	4.75	0.40	1.80	± 13.1 %
5750	35.4	5.22	4.90	4.90	4.90	0.40	1.80	± 13.1 %

[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] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

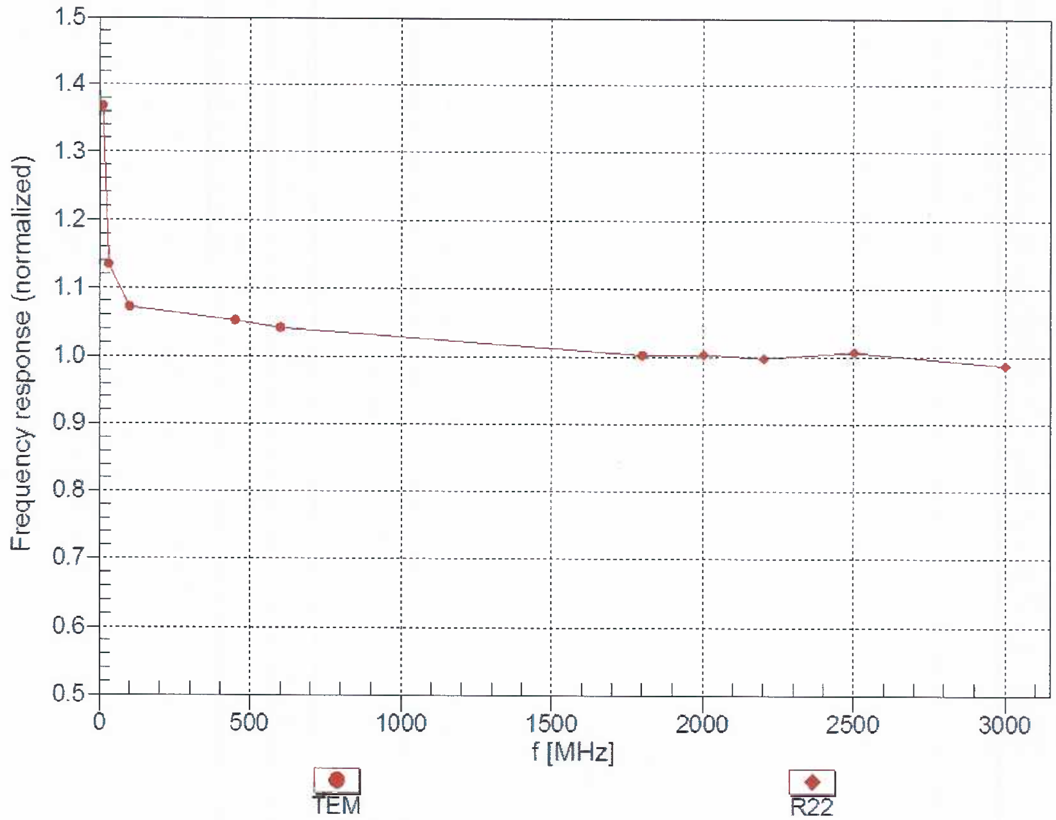
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3662

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
6500	34.5	6.07	5.55	5.55	5.55	0.20	2.00	± 18.6 %

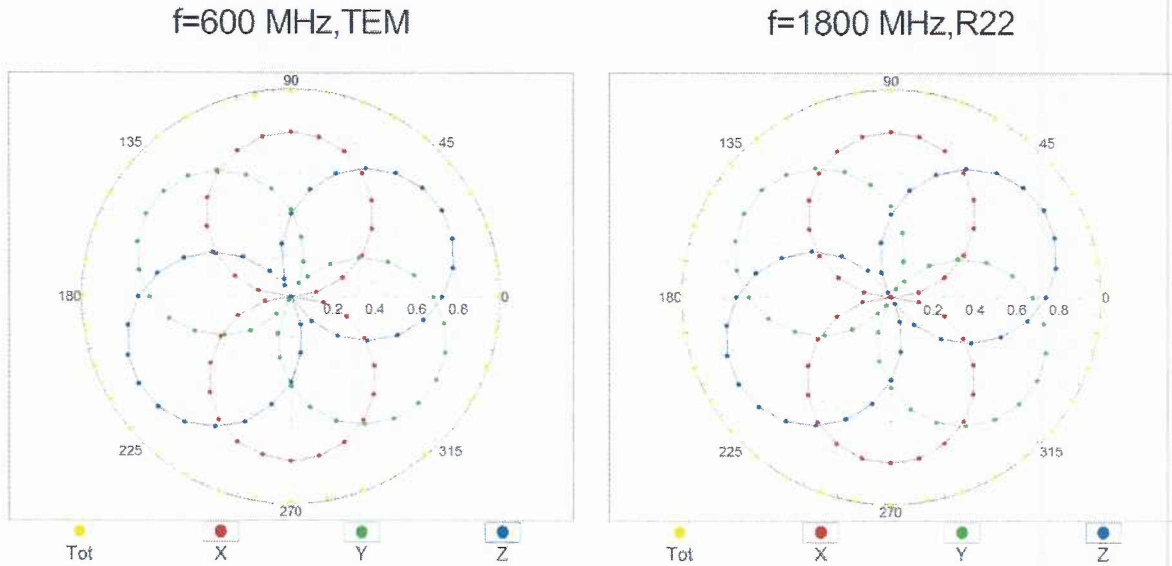
[C] Frequency validity above 6GHz is ± 700 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies 6-10 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz; below ± 2% for frequencies between 3-6 GHz; and below ± 4% for frequencies between 6-10 GHz at any distance larger than half the probe tip diameter from the boundary.

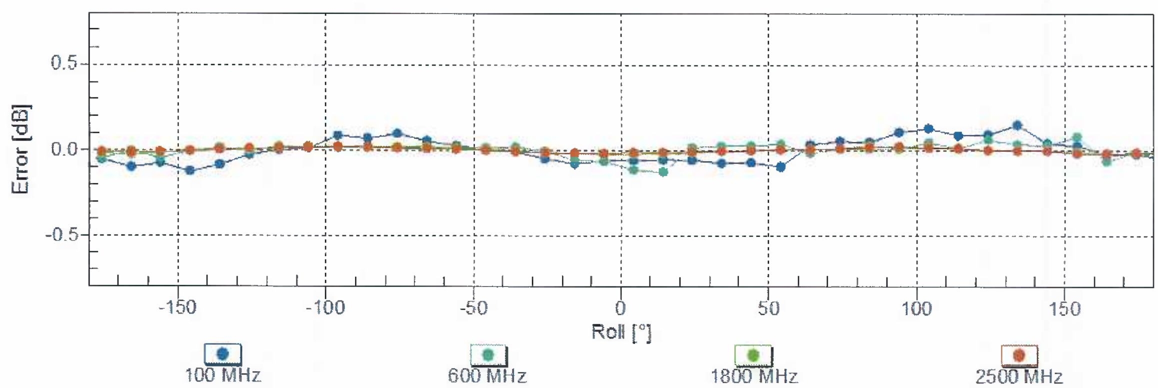
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

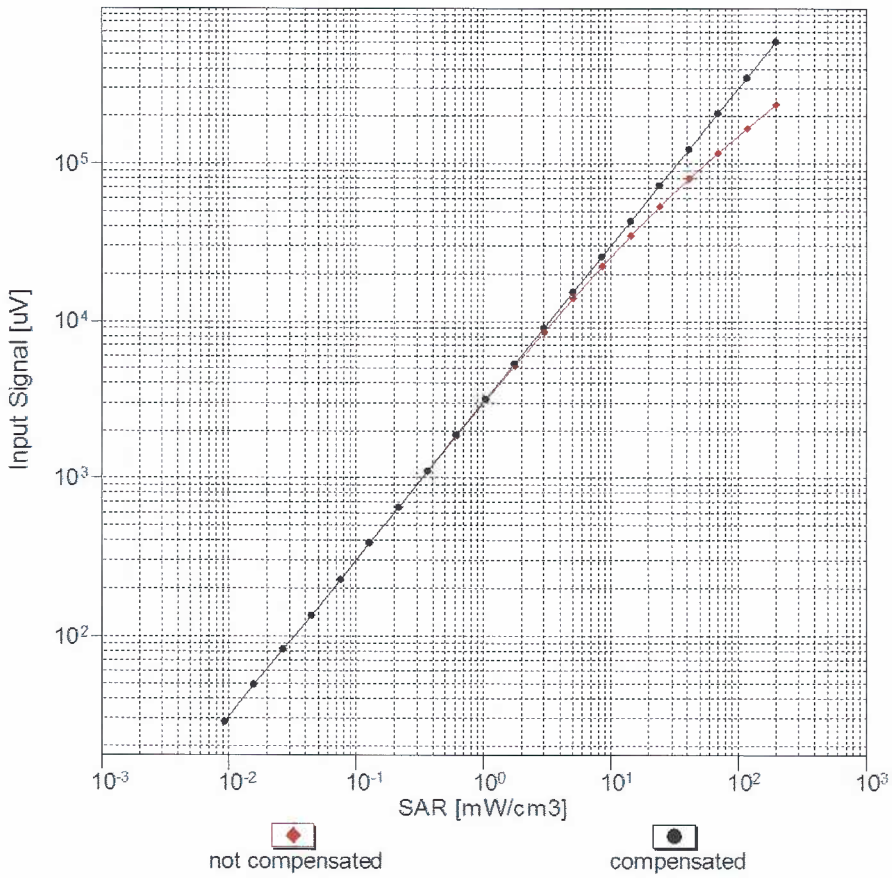
Receiving Pattern (ϕ), $\vartheta = 0°$

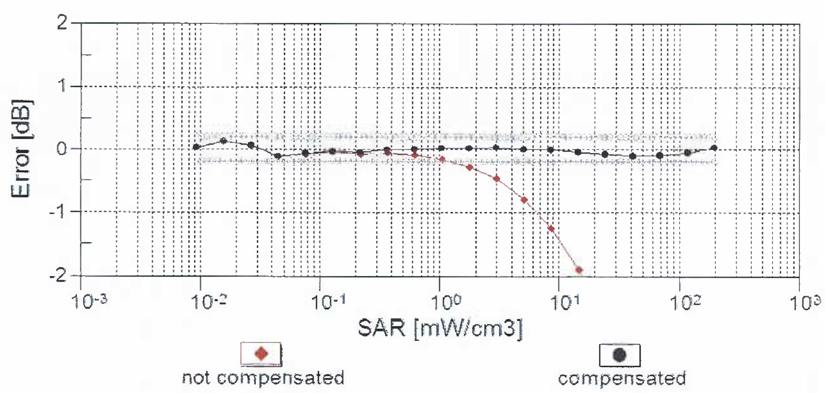




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

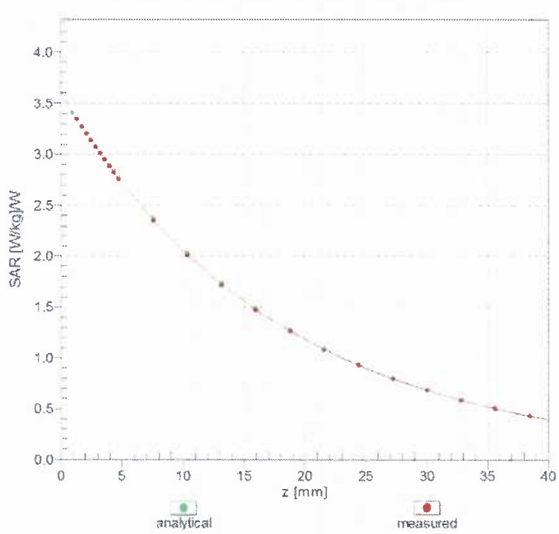
Dynamic Range f(SAR_{head})
(TEM cell , f_{eval}= 1900 MHz)

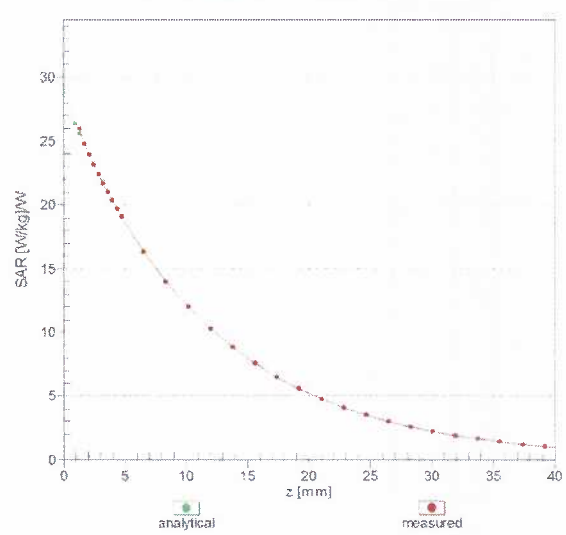




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

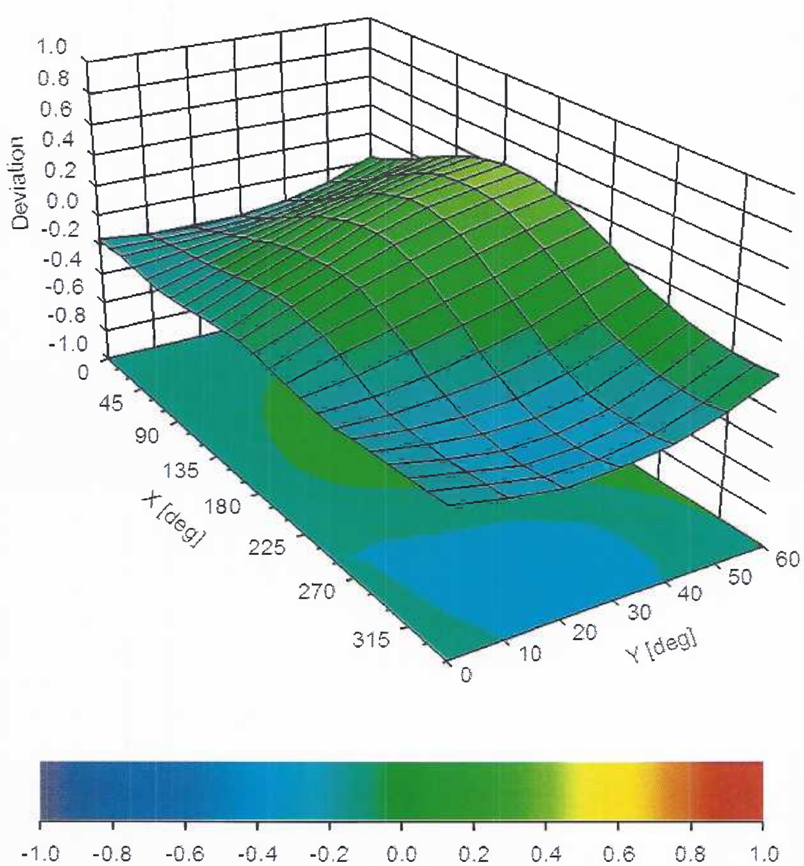
Conversion Factor Assessment





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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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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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	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

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

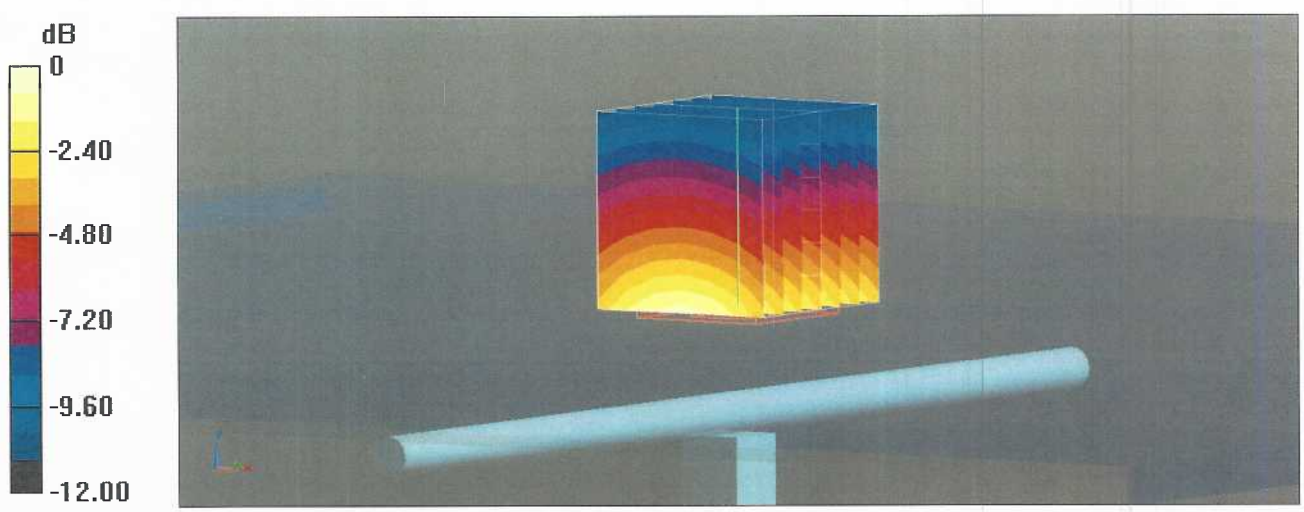
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma = 0.91$ S/m; $\varepsilon_r = 42.7$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

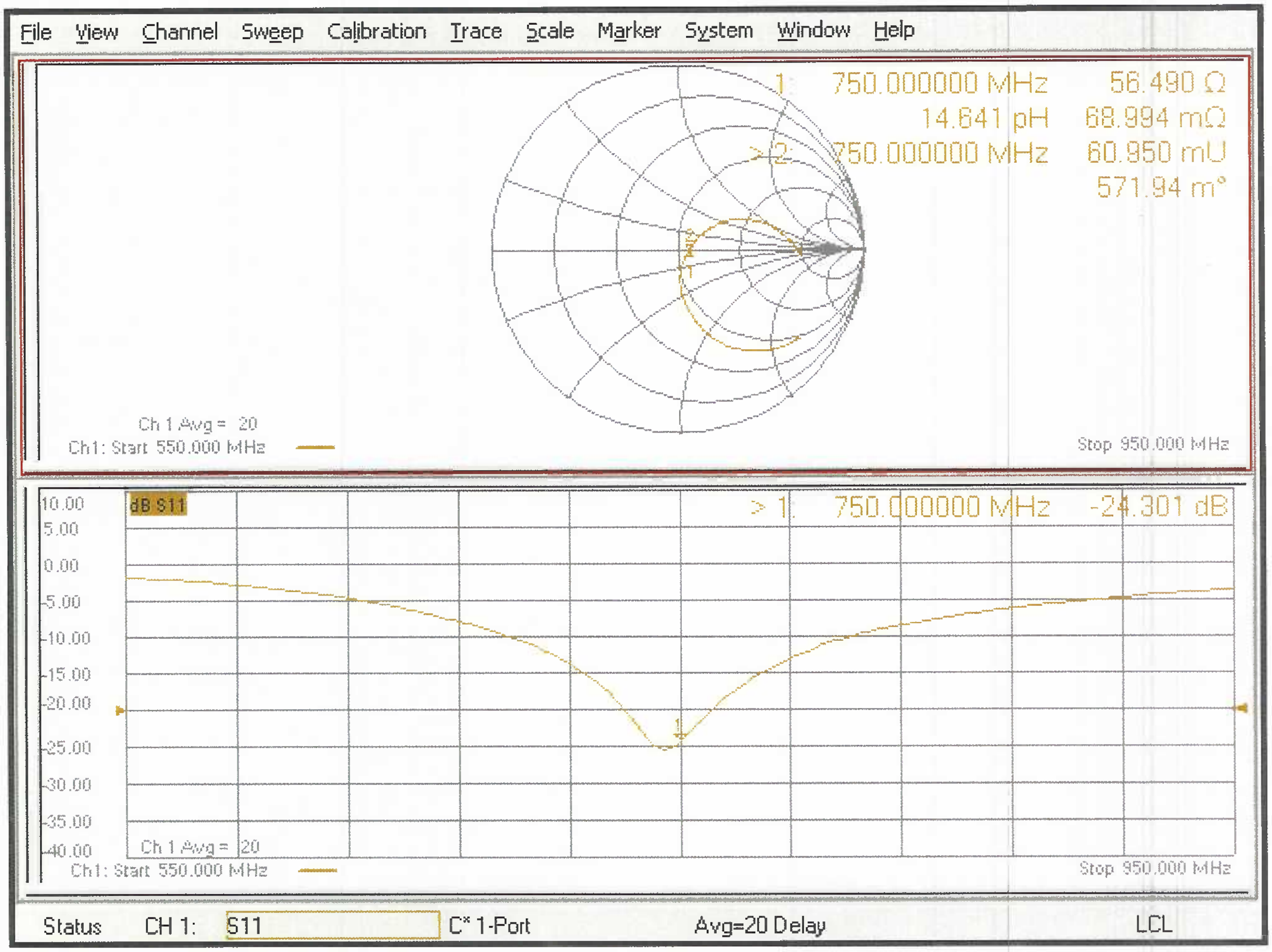
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

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

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Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

DASY5 Validation Report for Head TSL

Date: 04.06.2021

Test Laboratory: SPEAG, Zurich, Switzerland

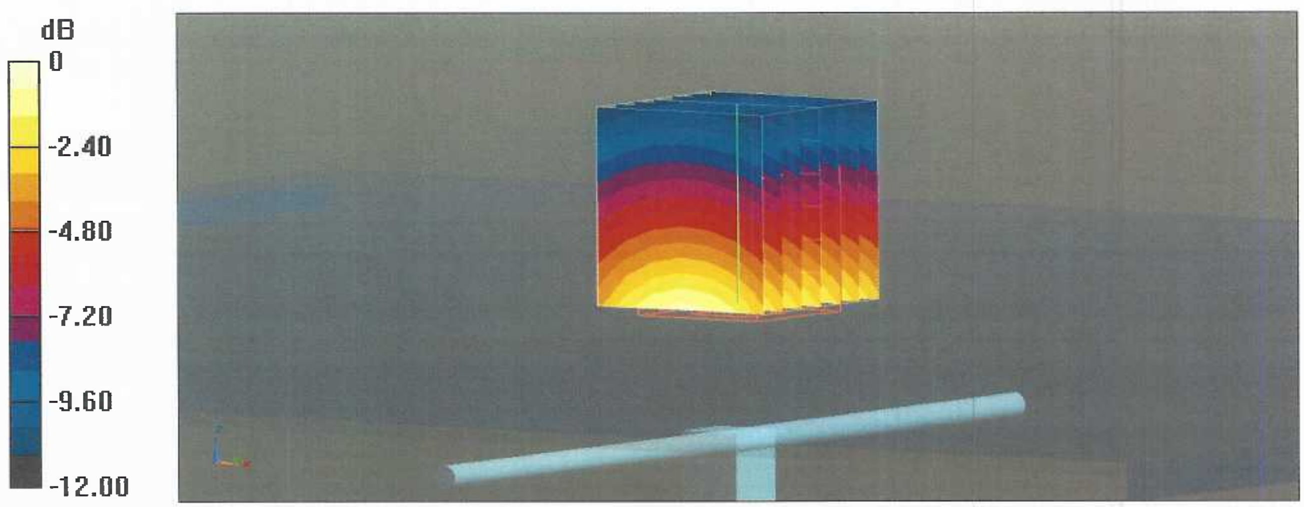
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:1d128

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:

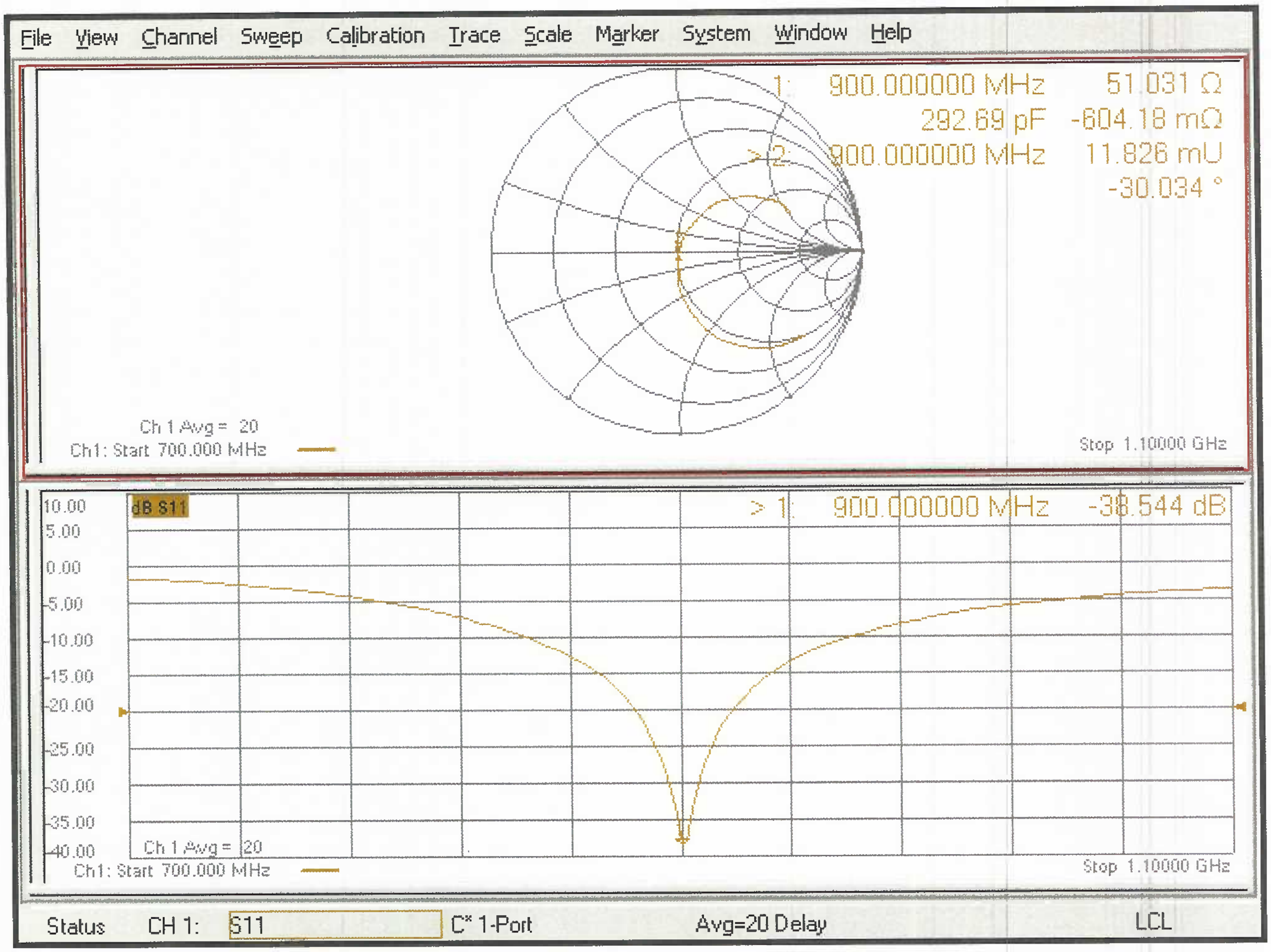
- Probe: EX3DV4 - SN7349; ConvF(9.62, 9.62, 9.62) @ 900 MHz; Calibrated: 28.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

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	
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 8, 2021

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Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

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

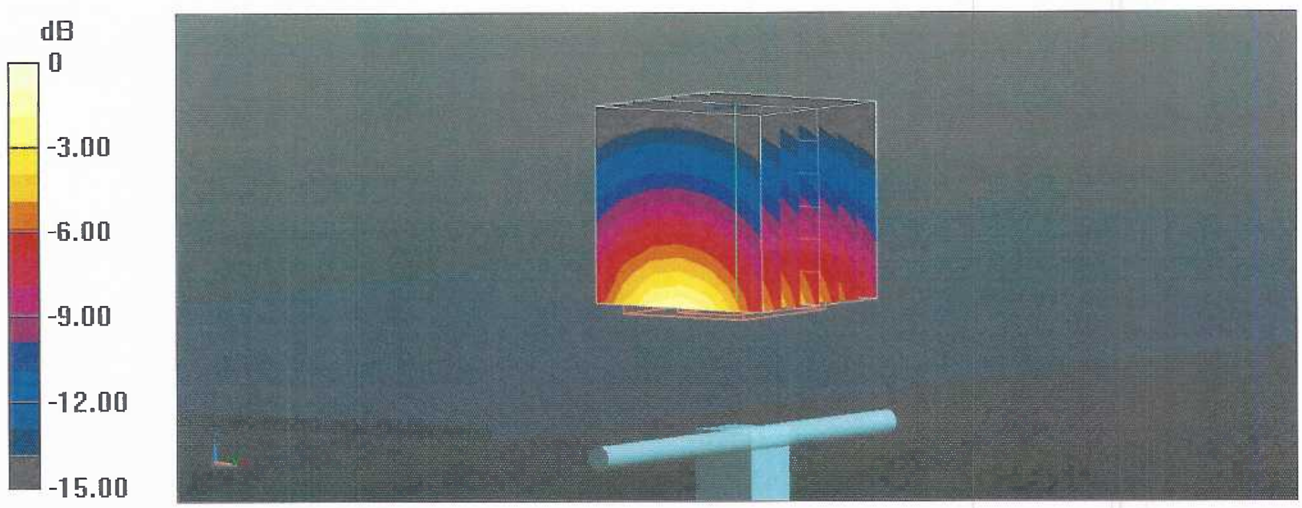
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.37 S/m; ε_r = 40.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

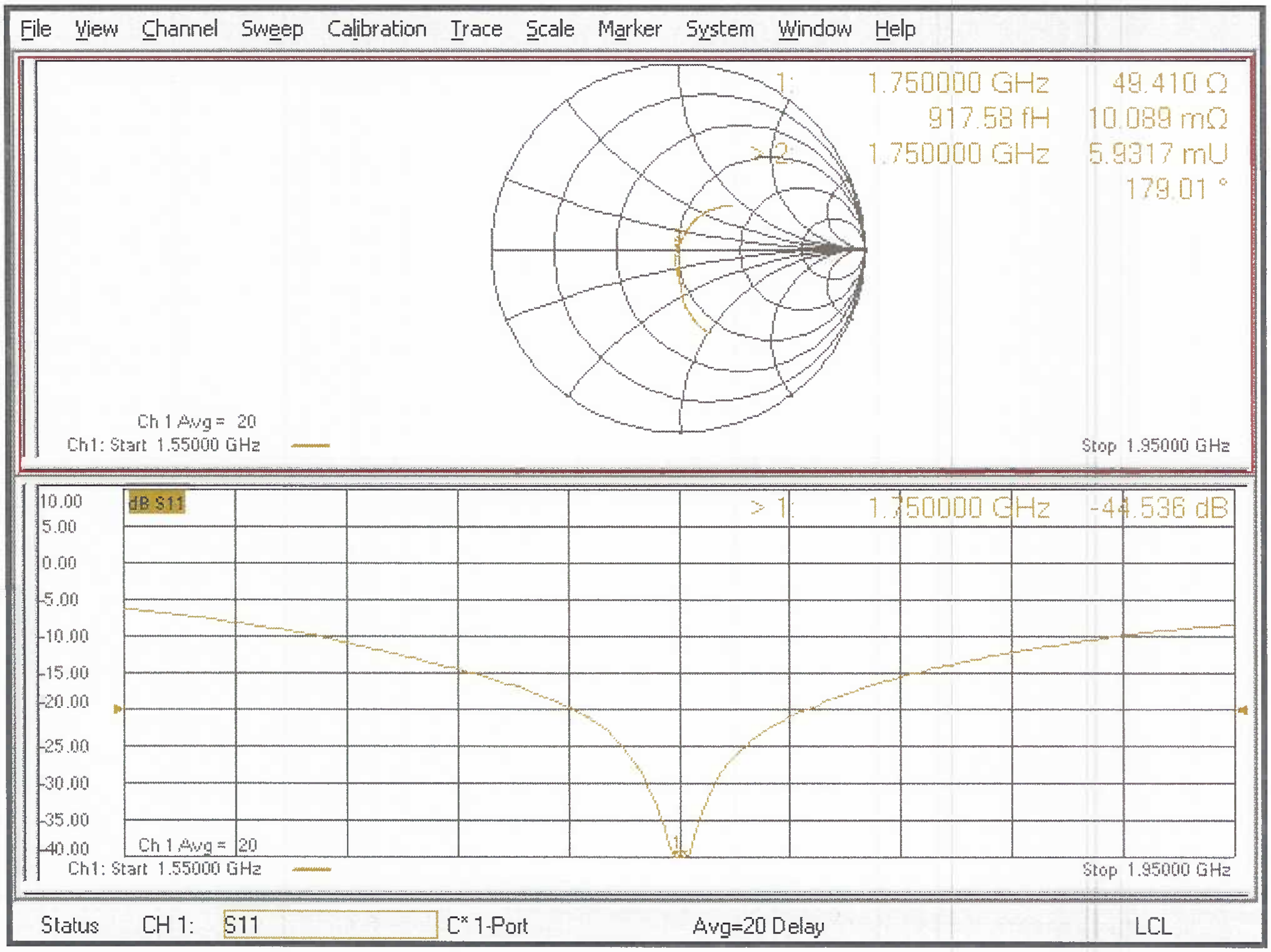
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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



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

S Schweizerischer Kalibrierdienst
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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

DASY5 Validation Report for Head TSL

Date: 04.06.2021

Test Laboratory: SPEAG, Zurich, Switzerland

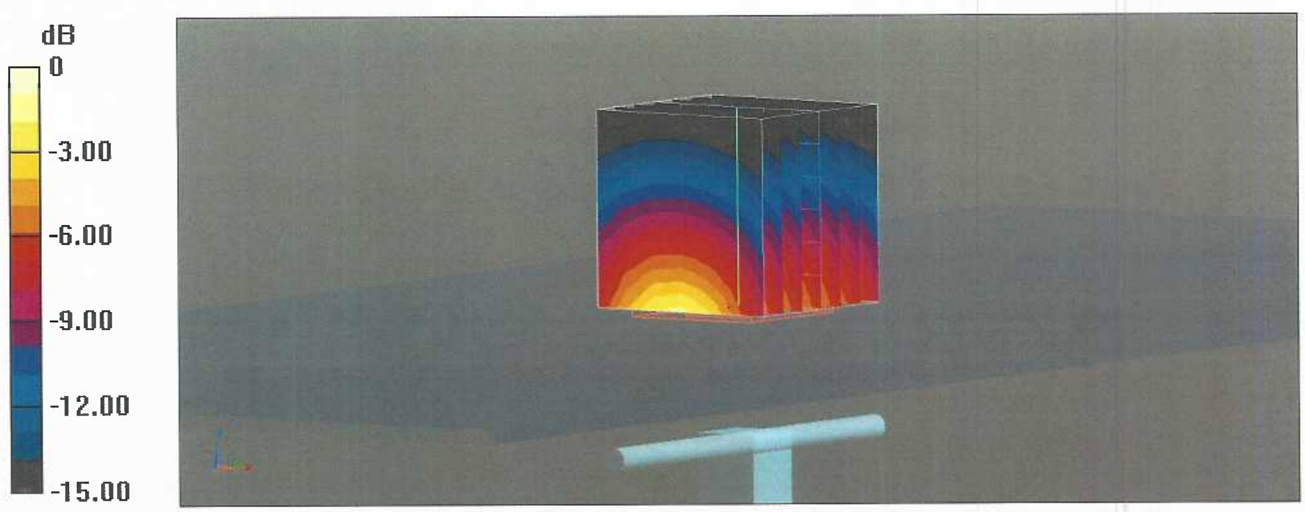
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d147

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:

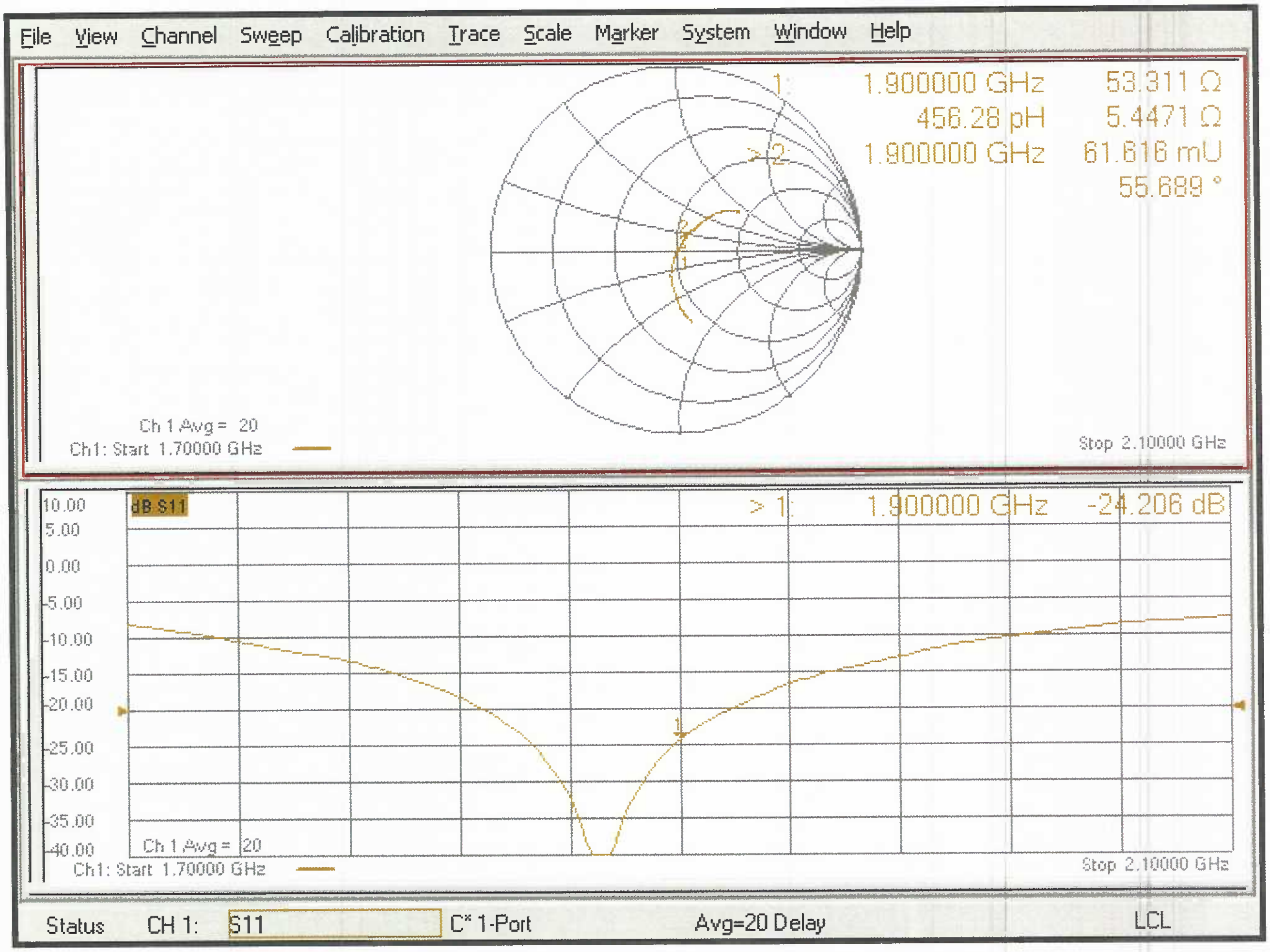
- Probe: EX3DV4 - SN7349; ConvF(8.43, 8.43, 8.43) @ 1900 MHz; Calibrated: 28.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

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



Appendix F – Phantom Calibration Data Sheets

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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
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**

s p e a g
Schmid & Partner Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Appendix G – 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 G-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 Valildation		
									Sens-itivity	Probe Linearity	Probe Isotropy	Modulation Type	Duty Factor	PAR
2	750	03/08/2021	3662	EX3DV4	750	Head	0.91	40.99	Pass	Pass	Pass	QPSK	Pass	Pass
2	900	03/08/2021	3662	EX3DV4	900	Head	1.40	39.61	Pass	Pass	Pass	GMSK	Pass	Pass
2	900	03/08/2021	3662	EX3DV4	900	Head	1.40	39.61	Pass	Pass	Pass	QPSK	Pass	Pass
2	1750	03/09/2021	3662	EX3DV4	1750	Head	1.42	39.26	Pass	Pass	Pass	QPSK	Pass	Pass
2	1900	03/09/2021	3662	EX3DV4	1900	Head	1.82	38.75	Pass	Pass	Pass	GMSK	Pass	Pass
2	1900	03/09/2021	3662	EX3DV4	1900	Head	1.82	38.75	Pass	Pass	Pass	QPSK	Pass	Pass

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