RF Exposure Lab

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CERTIFICATE OF COMPLIANCE
SAR EVALUATION

Attenti Group 1838 Gunn Hwy. Odessa, FL 33556	Dates of Test: June 3-11, 2021 Test Report Number: SAR.20210606

FCC ID:	NC3-24074AVL
IC Certificate:	23669-24074AVL
Model(s):	RTCVZ3
Test Sample:	Engineering Unit Same as Production
Serial No.:	36090012
Equipment Type:	Tracking Phone
Classification:	Portable Transmitter Next to Head and Body
TX Frequency Range:	699 – 716 MHz; 777 – 787 MHz; 824 – 849 MHz; 1710 – 1755 MHz; 1850 – 1910 MHz, 2412 – 2462 MHz
Frequency Tolerance:	± 2.5 ppm
Maximum RF Output:	750 MHz (LTE) – 24.0 dBm, 835 MHz (LTE) – 24.0 dBm, 1750 MHz (LTE) – 24.0 dBm, 1900 MHz (LTE) – 24.0 dBm, 2450 MHz (WiFi) – 18.3 dBm Conducted
Signal Modulation:	QPSK, 16QAM, DSSS, OFDM
Antenna Type:	Internal Antenna
Application Type:	Certification
FCC Rule Parts:	Part 2, 22, 24, 27
KDB Test Methodology:	KDB 447498 D01 v06, KDB 941225 D05 v02r05, KDB 865664 D01 v01r04, KDB 865664 D02 v01r02, KDB 648474 D04 v01r03
Industry Canada:	RSS-102 Issue 5, Safety Code 6
Max. Stand Alone SAR Value:	1.23 W/kg Reported Head; 1.50 W/kg Reported Body
Max. Simultaneous SAR Value:	1.36 W/kg Reported Head; 1.58 W/kg Reported Body
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 62209-2:2010 (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

Table of Contents

Comment/Revision	Date
Original Release	June 16, 2021

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

1. Introduction

This measurement report shows compliance of the Attenti Group Model RTCVZ3 FCC ID: NC3-24074AVL with FCC Part 2, 1093, ET Docket 93-62 Rules for mobile and portable devices and IC Certificate: 23669-24074AVL 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 Attenti Group Model RTCVZ3 and therefore apply only to the tested sample.

The test procedures, 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 RTCVZ3 wireless Tracking Phone. The table also shows the tolerance for the power level for each mode.

Band	Technology	Class	3GPP Nominal Power dBm	Setpoint Nominal Power dBm	Tolerance dBm	Lower Tolerance dBm	Upper Tolerance dBm
Band 2	LTE	3	22.0	22.5	±1.5	21.0	24.0
Band 5	LTE	3	22.0	22.5	±1.5	21.0	24.0
Band 4	LTE	3	22.0	22.5	±1.5	21.0	24.0
Band 12	LTE	3	22.0	22.5	±1.5	21.0	24.0
Band 13	LTE	3	22.0	22.5	±1.5	21.0	24.0
WiFi	802.11bgn	N/A	N/A	N/A	N/A	N/A	18.3
ISM	FM	N/A	N/A	N/A	N/A	N/A	20.0

Note: The ISM band radio operates at a low duty cycle which allows it to be excluded from SAR testing. The ISM band radio operates at a 3.55% duty cycle. Based on this, the maximum average power for the radio is calculated below.

ISM: 20.0 dBm = 100 mW; 100 mW * 3.55% = 3.55 mW maximum average power.

The transmitter is excluded from SAR testing based on KDB447498 D01 v06 section 4.3.1 a) on page 12 and RSS-102 Issue 5 section 2.5.1 Table 1 on page 4.

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)

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.

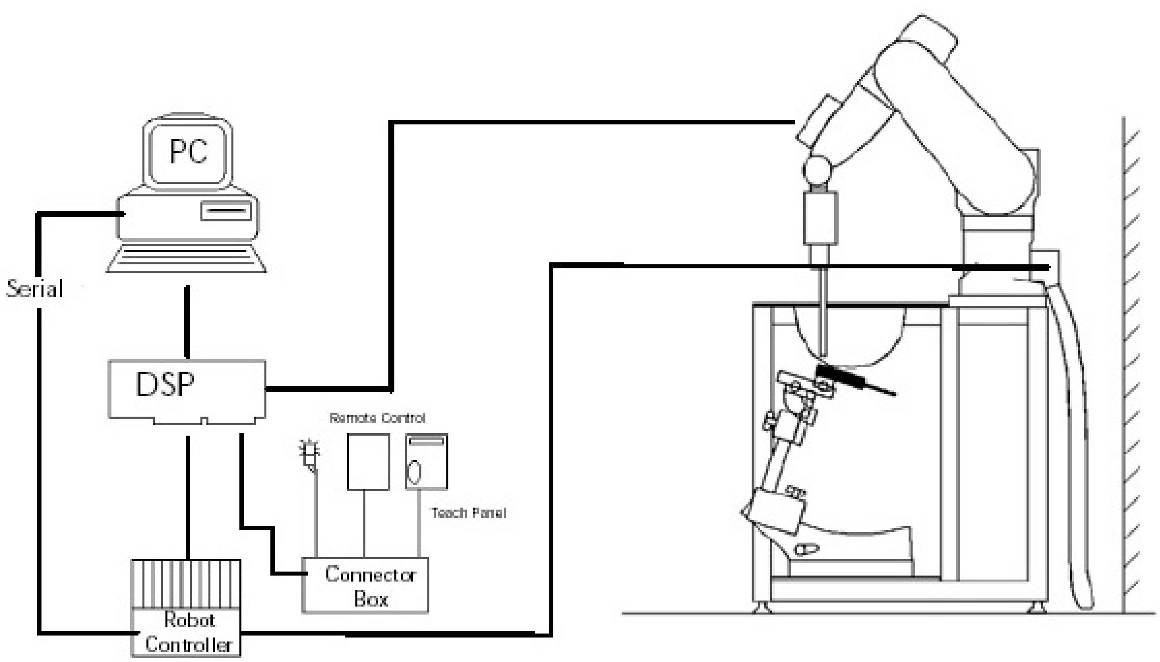


Figure 2.1 SAR Measurement System Setup

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

Probe Specifications

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

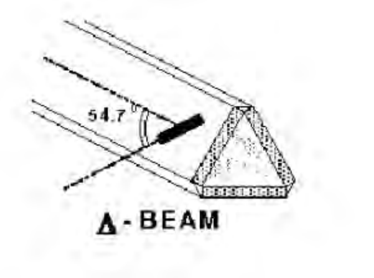


Figure 2.2 Triangular Probe Configurations

Frequency: 10 MHz to 6 GHz

Linearity: ±0.2dB (30 MHz to 6 GHz)

Dynamic: 10 mW/kg to 100 W/kg

Range: Linearity: ±0.2dB

Dimensions: Overall length: 330 mm

Tip length: 20 mm

Body diameter: 12 mm

Tip diameter: 2.5 mm

Distance from probe tip to sensor center: 1 mm

Figure 2.3 Probe Thick-Film Technique

Application: SAR Dosimetry Testing
Compliance tests of wireless device

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

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

where:

Δt = exposure time (30 seconds),

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

ΔT = temperature increase due to RF exposure.

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

where:

σ = simulated tissue conductivity,

ρ = Tissue density (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;

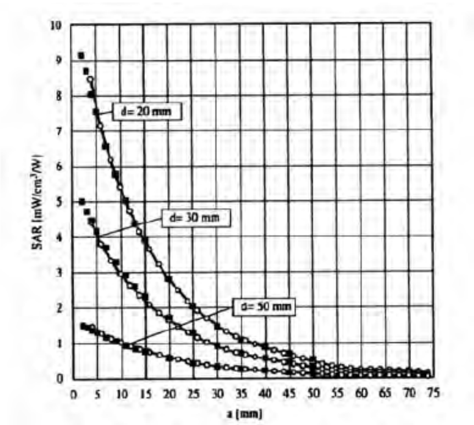


Figure 2.4 E-Field and Temperature Measurements at 900MHz

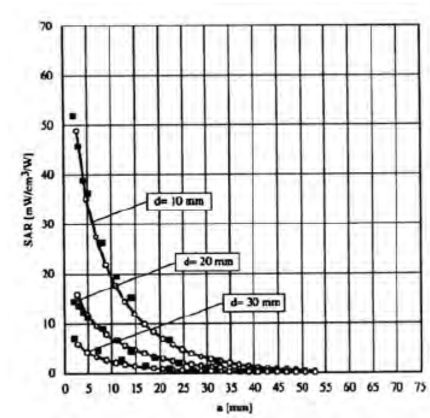


Figure 2.5 E-Field and Temperature Measurements at 1800MHz

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

Scanning procedure

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

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

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

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

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

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

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

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

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

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.

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

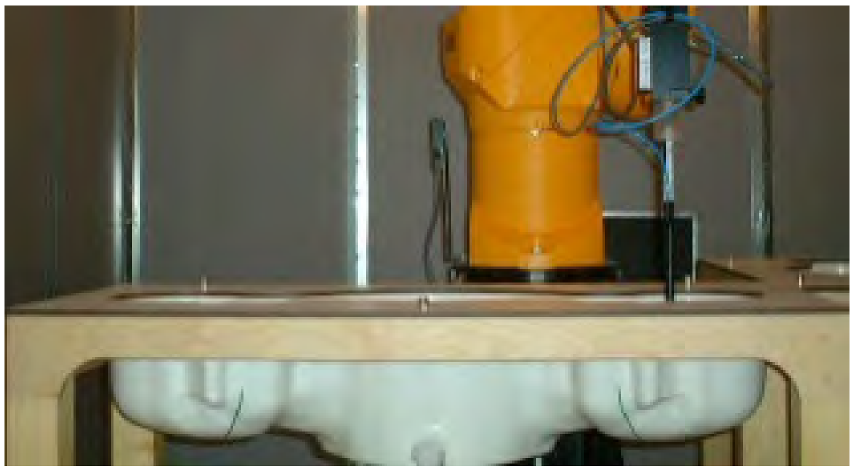


Figure 2.6 SAM Twin Phantom

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.

3. Definition of Reference Points

Ear Reference Point

Figure 3.2 shows the front, back and side views of the SAM Phantom. The point “M” is the reference point for the center of the mouth, “LE” is the left ear reference point (ERP), and “RE” is the right ERP. The ERPs are 15mm posterior to the entrance to the ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 3.1. The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front) is perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 3.1). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning [5].

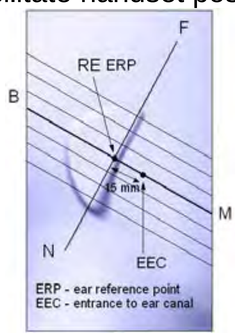


Figure 3.1 Close-up side view of ERP’s

Figure 3.2 Front, back and side view of SAM

Device Reference Points

Two imaginary lines on the device need to be established: the vertical centerline and the horizontal line. The test device is placed in a normal operating position with the “test device reference point” located along the “vertical centerline” on the front of the device aligned to the “ear reference point” (See Fig. 3.3). The “test device reference point” is than located at the same level as the center of the ear reference point. The test device is positioned so that the “vertical centerline” is bisecting the front surface of the device at it’s top and bottom edges, positioning the “ear reference point” on the outer surface of both the left and right head phantoms on the ear reference point [5].

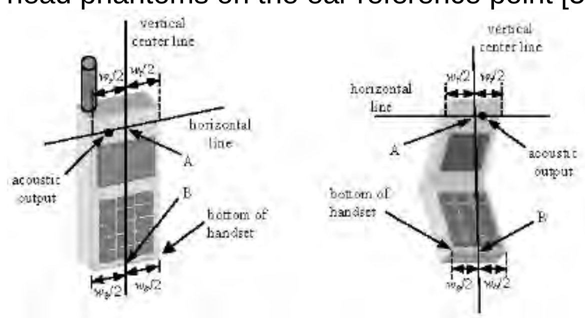


Figure 3.3 Handset Vertical Center & Horizontal Line Reference Points

4. Test Configuration Positions

Positioning for Cheek/Touch [5]

1. Position the device close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 4.1), such that the plane defined by the vertical center line and the horizontal line of the device is approximately parallel to the sagittal plane of the phantom.

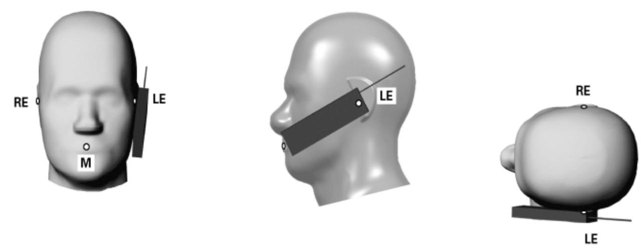


Figure 4.1 Front, Side and Top View of Cheek/Touch Position

2. Translate the device towards the phantom along the line passing through RE and LE until the device touches the ear.

3. While maintaining the device in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to MB-NF including the line MB (called the reference plane).

4. Rotate the device around the vertical centerline until the device (horizontal line) is symmetrical with respect to the line NF.

5. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE and maintaining the device contact with the ear, rotate the device about the line NF until any point on the device is in contact with a phantom point below the ear (cheek). See Figure 4.2.

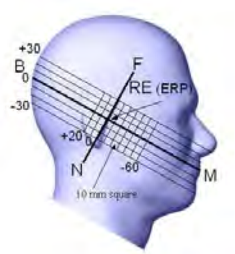


Figure 4.2 Side view w/ relevant markings

Positioning for Ear / 15˚ Tilt [5]

With the test device aligned in the Cheek/Touch Position":

1. While maintaining the orientation of the device, retracted the device parallel to the reference plane far enough to enable a rotation of the device by 15 degrees.

2. Rotate the device around the horizontal line by 15 degrees.

3. While maintaining the orientation of the device, move the device parallel to the reference plane until any part of the device touches the head. (In this position, point A is located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna, the angle of the device shall be reduced. The tilted position is obtained when any part of the device is in contact with the ear as well as a second part of the device is in contact with the head (see Figure 4.3).

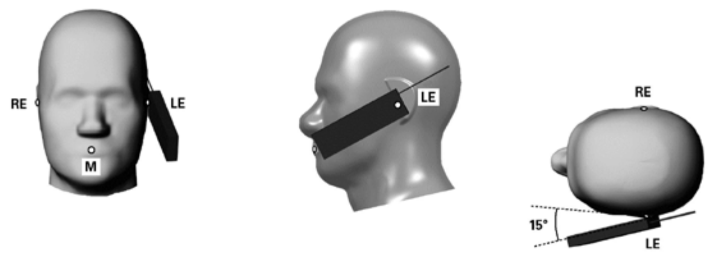


Figure 4.3 Front, Side and Top View of Ear/15˚ Tilt Position

Body Worn Configurations

Body-worn operating configurations are tested with the accessories attached to the device and positioned against a flat phantom in a normal use configuration. A device with a headset output is tested with a headset connected to the device. Body dielectric parameters are used.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then, when multiple accessories that contain metallic components are supplied with the device, the device is tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration where a separation distance between the back of the device and the flat phantom is used. All test position spacings are documented.

Transmitters that are designed to operate in front of a person’s face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessory(ies), including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

In all cases SAR measurements are performed to investigate the worst-case positioning. Worst-case positioning is then documented and used to perform Body SAR testing.

In order for users to be aware of the body-worn operating requirements for meeting RF exposure compliance, operating instructions and cautions statements are included in the user’s manual.

5. Probe and Dipole Calibration

See Appendix D and E.

6. 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 6.1 Typical Composition of Ingredients for Tissue

Ingredients		Simulating Tissue				
		750 MHz Head	835 MHz Head	1750 MHz Head	1900 MHz Head	2450 MHz Head
Mixing Percentage						
Water		Proprietary Purchased From Speag	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	41.52	40.08	40.00	39.20
Conductivity (S/m)	Target	0.89	0.95	1.37	1.40	1.80

7. 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 7.1 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.

8. Measurement Uncertainty

Exposure Assessment Measurement Uncertainty

Relative DASY5 Uncertainty Budget for SAR Tests								
According to IEC62209-2/2010 (30 MHz - 6 GHz range)								
Error Description	Uncertainty Value	Probability Distribution	Divisor	c_i (1g)	c_i (10g)	Standard Uncertainty ± %, (1g)	Standard Uncertainty ± %, (10g)	v_i^2 or v_{eff}
Measurement System								
Probe calibration	± 6.6%	Normal	1	1	1	± 6.6%	± 6.6%	∞
Axial isotropy	± 4.7%	Rectangular	√3	0.7	0.7	± 1.9%	± 1.9%	∞
Hemispherical isotropy	± 9.6%	Rectangular	√3	0.7	0.7	± 3.9%	± 3.9%	∞
Boundary effects	± 2.0%	Rectangular	√3	1	1	± 1.2%	± 1.2%	∞
Probe linearity	± 4.7%	Rectangular	√3	1	1	± 2.7%	± 2.7%	∞
System detection limits	± 1.0%	Rectangular	√3	1	1	± 0.6%	± 0.6%	∞
Modulation response	± 2.4%	Rectangular	√3	1	1	± 1.4%	± 1.4%	∞
Readout electronics	± 0.3%	Normal	1	1	1	± 0.3%	± 0.3%	∞
Response time	± 0.8%	Rectangular	√3	1	1	± 0.5%	± 0.5%	∞
Integration time	± 2.6%	Rectangular	√3	1	1	± 1.5%	± 1.5%	∞
RF ambient noise	± 3.0%	Rectangular	√3	1	1	± 1.7%	± 1.7%	∞
RF ambient reflections	± 3.0%	Rectangular	√3	1	1	± 1.7%	± 1.7%	∞
Probe positioner	± 0.8%	Rectangular	√3	1	1	± 0.5%	± 0.5%	∞
Probe positioning	± 6.7%	Rectangular	√3	1	1	± 3.9%	± 3.9%	∞
Post-processing	± 4.0%	Rectangular	√3	1	1	± 2.3%	± 2.3%	∞
Test Sample Related								
Device positioning	± 2.9%	Normal	1	1	1	± 2.9%	± 2.9%	145
Device holder uncertainty	± 3.6%	Normal	1	1	1	± 3.6%	± 3.6%	5
Power drift	± 5.0%	Rectangular	√3	1	1	± 2.9%	± 2.9%	∞
Phantom and Setup								
Phantom uncertainty	± 7.9%	Rectangular	√3	1	1	± 4.6%	± 4.6%	∞
SAR algorithm correction	± 1.9%	Normal	1	1	0.84	± 1.9%	± 1.9%	∞
Liquid conductivity (meas.)	± 5.0%	Rectangular	√3	0.78	0.71	± 0.1%	± 0.1%	∞
Liquid permittivity (meas.)	± 5.0%	Rectangular	√3	0.26	0.26	± 0.1%	± 0.1%	∞
Temp. Unc. – Conductivity	± 3.4%	Rectangular	√3	0.78	0.71	± 1.5%	± 1.5%	∞
Temp. Unc. – Permittivity	± 0.4%	Rectangular	√3	0.23	0.26	± 0.1%	± 0.1%	∞
Combined Uncertainty						± 12.4%	± 12.3%	330
Expanded Std. Uncertainty						± 24.8%	± 24.6%	

Worst case uncertainty budget for DASY5 assessed according to IEC62209-2/2010 standard. The budget is valid for the frequency range 30 MHz – 6 GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerable smaller.

9. System Validation

Tissue Verification

Table 9.1 Measured Tissue Parameters

		750 MHz Head		750 MHz Head		900 MHz Head	
Date(s)		Jun. 8, 2021		Jun. 9, 2021		Jun. 4, 2021	
Liquid Temperature (˚C)	20.0	Target	Measured	Target	Measured	Target	Measured
Dielectric Constant: ε		41.94	41.55	41.94	41.14	41.50	41.14
Conductivity: σ		0.89	0.91	0.89	0.91	0.97	1.01
		900 MHz Head		1750 MHz Head		1750 MHz Head	
Date(s)		Jun. 9, 2021		Jun. 7, 2021		Jun. 9, 2021	
Liquid Temperature (˚C)	20.0	Target	Measured	Target	Measured	Target	Measured
Dielectric Constant: ε		41.50	40.62	40.08	39.63	40.08	39.35
Conductivity: σ		0.97	1.00	1.37	1.42	1.37	1.39
		1900 MHz Head		1900 MHz Head		2450 MHz Head	
Date(s)		Jun. 3, 2021		Jun. 10, 2021		Jun. 11, 2021	
Liquid Temperature (˚C)	20.0	Target	Measured	Target	Measured	Target	Measured
Dielectric Constant: ε		40.00	39.46	40.00	39.51	39.20	38.04
Conductivity: σ		1.40	1.46	1.40	1.44	1.80	1.82

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 9.2 System Dipole Validation Target & Measured

	Test Frequency	Targeted SAR_{1g} (W/kg)	Measure SAR_{1g} (W/kg)	Tissue Used for Verification	Deviation (%)	Plot Number
08-Jun-2021	750 MHz	8.23	8.25	Head	+ 0.24	1
04-Jun-2021	835 MHz	10.90	11.30	Head	+ 3.67	2
07-Jun-2021	1750 MHz	36.10	36.70	Head	+ 1.66	3
03-Jun-2021	1900 MHz	40.60	41.00	Head	+ 0.99	4
09-Jun-2021	750 MHz	8.23	8.26	Head	+ 0.36	5
09-Jun-2021	835 MHz	10.90	11.10	Head	+ 1.83	6
09-Jun-2021	1750 MHz	36.10	36.80	Head	+ 1.94	7
10-Jun-2021	1900 MHz	40.60	40.90	Head	+ 0.74	8
11-Jun-2021	2450 MHz	51.70	52.30	Head	+ 1.16	9

See Appendix A for data plots.

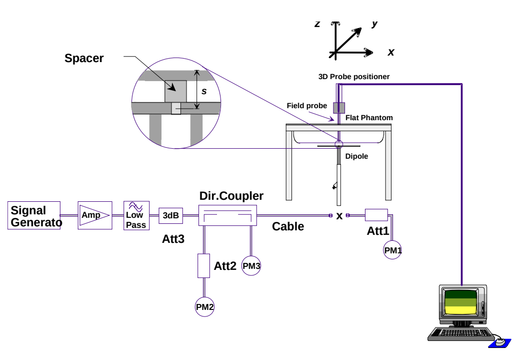


Figure 9.1 Dipole Validation Test Setup

10. LTE Document Checklist

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

LTE Operating Band	Uplink (transmit)	Downlink (Receive)	Duplex mode (FDD/TDD)
	Low - high	Low - high	
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

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, 3, 5, 10, 15, 20	1850-1910 MHz
4	1.4, 3, 5, 10, 15, 20	1710-1755 MHz
5	1.4, 3, 5, 10	824-849
12	1.4, 3, 5, 10	699-716
13	5, 10	777-787 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
2	3	1851.5	18615	1880.0	18900	1908.5	19185
2	5	1852.5	18625	1880.0	18900	1907.5	19175
2	10	1855.0	18650	1880.0	18900	1905.0	19150
2	15	1857.5	18675	1880.0	18900	1902.5	19125
2	20	1860.0	18700	1880.0	18900	1900.0	19100
4	1.4	1710.7	19957	1732.5	20175	1754.3	20393
4	3	1711.5	19965	1732.5	20175	1753.5	20385
4	5	1712.5	19975	1732.5	20175	1752.5	20375
4	10	1715.0	20000	1732.5	20175	1750.0	20350
4	15	1717.5	20025	1732.5	20175	1747.5	20325
4	20	1720.0	20050	1732.5	20175	1745.0	20300
5	1.4	824.7	20407	836.5	20525	848.3	20643
5	3	825.5	20415	836.5	20525	847.5	20635
5	5	826.5	20425	836.5	20525	846.5	20625
5	10	829.0	20450	836.5	20525	844.0	20600
12	1.4	699.7	23017	707.5	23095	715.3	23173
12	3	700.5	23025	707.5	23095	714.5	23165
12	5	701.5	23035	707.5	23095	713.5	23155
12	10	704.0	23060	707.5	23095	711.0	23130
13	5	779.5	23205	782.0	23230	784.5	23225
13	10	-----	-----	782.0	23230	-----	-----

4) Specify the UE category and uplink modulations used:
- UE Category: 3
- 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 4 antennas:

- WWAN Main (Transmit and Receive) Antenna
- WWAN Aux (Receive) Diversity Antenna
- WiFi Main Antenna
- ISM Band Antenna

Transmission relationship

- All LTE transmission (TX) is limited to the WWAN antenna only
- Rx is on Main and Aux
- Simultaneous evaluation is conducted for the WWAN & WiFi, WWAN & ISM and WiFi & ISM

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 voice/data device. Voice and data mode was tested in each operating mode and exposure condition in the head and body configuration. See test setup photos to see all configurations tested.

7) Identify if Maximum Power Reduction (MPR) is optional or mandatory, i.e. built-in by design:

a) Only mandatory MPR may be considered during SAR testing, when the maximum output power is permanently limited by the MPR implemented within the UE; and only for the applicable RB (resource block) configurations specified in LTE standards

MPR is mandatory, built-in by design on all production units. It was enabled during testing.

Modulation	Channel Bandwidth/transmission Bandwidth Configuration (RB)						MPR (dB)
	1.4 MHz	3.0 MHZ	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

b) A-MPR (additional MPR) must be disabled
c) A-MPR was disabled during testing.

8) 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 31-41 of this report. The below table shows the factory set point with the allowable tolerance.

Band	Technology	Class	3GPP Nominal Power dBm	Setpoint Nominal Power dBm	Tolerance dBm	Lower Tolerance dBm	Upper Tolerance dBm
Band 2	LTE	3	22.0	22.5	±1.5	21.0	24.0
Band 5	LTE	3	22.0	22.5	±1.5	21.0	24.0
Band 4	LTE	3	22.0	22.5	±1.5	21.0	24.0
Band 12	LTE	3	22.0	22.5	±1.5	21.0	24.0
Band 13	LTE	3	22.0	22.5	±1.5	21.0	24.0

9) 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:
The device contains a WiFi and ISM transmitter as well. Both transmitters are low duty cycle and excluded from SAR testing per the KDB submitted to the FCC. Simultaneous Tx is evaluated below.

Band	Technology	Class	3GPP Nominal Power dBm	Setpoint Nominal Power dBm	Tolerance dBm	Lower Tolerance dBm	Upper Tolerance dBm
WiFi	802.11bgn	N/A	N/A	N/A	N/A	N/A	18.3
ISM	FM	N/A	N/A	N/A	N/A	N/A	20.0

Note: The ISM band radio operates at a low duty cycle which allows it to be excluded from SAR testing. The ISM band radio operates at a 3.55% duty cycle. Based on this, the maximum average power for the radio is calculated below.

ISM: 20.0 dBm = 100 mW; 100 mW * 3.55% = 3.55 mW maximum average power.

The transmitter is excluded from SAR testing based on KDB447498 D01 v06 section 4.3.1 a) on page 12 and RSS-102 Issue 5 section 2.5.1 Table 1 on page 4.

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

The maximum average conducted output power was not measured for this report. The table in item 9 shows the factory set point with the allowable tolerance.

11) 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.)

The device is able to transmit simultaneously with the WWAN & WiFi, WWAN & ISM and WiFi & ISM.

12) 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.

13) 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.

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

    Power reduction is not required to satisfy SAR compliance.

15) 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.

11. 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 next to the ear on the left and right side of the SAM phantom for all head measurements. The device was tested with the front of the phone towards the body as well as with the back towards the body. The device was tested with the device installed next to the ELI Flat phantom for all body measurements. The WiFi was tested on the Back side only to allow for the simultaneous evaluation to be conducted and pass the requirements. All other measurements for the WiFi was omitted as the transmitter was excluded from SAR testing. All measurements were conducted with the side of the device in direct contact with the phantom. All further test reductions are shown on pages 42-54. The device does allow for simultaneous Tx with the three radios. Please see the simultaneous evaluation below on page 61 of this report. 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.

11.1 SAR Measurement Conditions for LTE Bands

11.1.1 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, 3, 5, 10, 15, 20	1850-1910 MHz
4	1.4, 3, 5, 10, 15, 20	1710-1755 MHz
5	1.4, 3, 5, 10	824-849
12	1.4, 3, 5, 10	699-716
13	5, 10	777-787 MHz

11.1.2 Test Conditions

All SAR measurements for LTE were performed using the Anritsu MT8820C. A closed loop power control setting allowed the UE to transmit at the maximum output power during the SAR measurements. The Figure 11.1 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.

Table 11.1.2.1 LTE Power Measurements

Band	Bandwidth	RB Size	RB Offset	Channel	Frequency	QPSK	16QAM
2	1.4 MHz	1	0	18607	1850.7	23.7	22.3
				18900	1880.0	23.5	22.9
				19193	1909.3	23.4	22.7
			3	18607	1850.7	23.5	22.7
				18900	1880.0	23.6	22.5
				19193	1909.3	23.5	22.5
			5	18607	1850.7	23.7	22.7
				18900	1880.0	23.5	22.4
				19193	1909.3	23.3	22.4
		3	0	18607	1850.7	23.8	22.5
				18900	1880.0	23.7	22.2
				19193	1909.3	23.2	22.3
			1	18607	1850.7	23.6	22.7
				18900	1880.0	23.6	22.7
				19193	1909.3	23.8	22.2
			3	18607	1850.7	23.8	22.8
				18900	1880.0	23.6	22.4
				19193	1909.3	23.9	22.5
		6	0	18607	1850.7	22.4	21.4
				18900	1880.0	22.5	21.5
				19193	1909.3	22.6	21.9
	3 MHz	1	0	18615	1851.5	23.3	22.9
				18900	1880.0	23.3	22.3
				19185	1908.5	23.4	22.6
			7	18615	1851.5	23.3	22.6
				18900	1880.0	23.6	22.6
				19185	1908.5	23.6	22.6
			14	18615	1851.5	23.3	22.7
				18900	1880.0	23.9	22.7
				19185	1908.5	23.5	22.7
		8	0	18615	1851.5	22.5	21.4
				18900	1880.0	22.5	21.8
				19185	1908.5	22.8	21.4
			7	18615	1851.5	22.3	21.3
				18900	1880.0	22.5	21.3
				19185	1908.5	22.9	21.5
			14	18615	1851.5	22.5	21.5
				18900	1880.0	22.6	21.4
				19185	1908.5	22.5	21.4
		15	0	18615	1851.5	22.7	21.5
				18900	1880.0	22.8	21.3
				19185	1908.5	22.3	21.9

Band	Bandwidth	RB Size	RB Offset	Channel	Frequency	QPSK	16QAM
2	5 MHz	1	0	18625	1852.5	23.5	22.7
				18900	1880.0	23.3	22.2
				19175	1907.5	23.7	22.7
			12	18625	1852.5	23.8	22.4
				18900	1880.0	23.8	22.4
				19175	1907.5	23.5	22.6
			24	18625	1852.5	23.2	22.8
				18900	1880.0	23.6	22.4
				19175	1907.5	23.5	22.4
		12	0	18625	1852.5	22.3	21.6
				18900	1880.0	22.4	21.4
				19175	1907.5	22.7	21.3
			6	18625	1852.5	22.4	21.8
				18900	1880.0	22.6	21.6
				19175	1907.5	22.4	21.8
			13	18625	1852.5	22.3	21.3
				18900	1880.0	22.8	21.2
				19175	1907.5	22.4	21.3
		25	0	18625	1852.5	22.3	21.8
				18900	1880.0	22.7	21.8
				19175	1907.5	22.8	21.6
	10 MHz	1	0	18650	1855.0	23.6	22.3
				18900	1880.0	23.5	22.7
				19150	1905.0	23.3	22.6
			24	18650	1855.0	23.3	22.7
				18900	1880.0	23.6	22.3
				19150	1905.0	23.8	22.2
			49	18650	1855.0	23.8	22.6
				18900	1880.0	23.8	22.4
				19150	1905.0	23.7	22.4
		25	0	18650	1855.0	22.6	21.9
				18900	1880.0	22.7	21.8
				19150	1905.0	22.4	21.8
			13	18650	1855.0	22.4	21.6
				18900	1880.0	22.3	21.7
				19150	1905.0	22.2	21.2
			25	18650	1855.0	22.8	21.6
				18900	1880.0	22.5	21.3
				19150	1905.0	22.3	21.6
		50	0	18650	1855.0	22.6	21.6
				18900	1880.0	22.7	21.7
				19150	1905.0	22.6	21.6

Band	Bandwidth	RB Size	RB Offset	Channel	Frequency	QPSK	16QAM
2	15 MHz	1	0	18675	1857.5	23.7	22.7
				18900	1880.0	23.8	22.7
				19125	1902.5	23.7	22.9
			37	18675	1857.5	23.4	22.8
				18900	1880.0	23.2	22.4
				19125	1902.5	23.4	22.5
			74	18675	1857.5	23.4	22.8
				18900	1880.0	23.3	22.7
				19125	1902.5	23.9	22.7
		36	0	18675	1857.5	22.8	21.9
				18900	1880.0	22.6	21.4
				19125	1902.5	22.3	21.4
			19	18675	1857.5	22.5	21.3
				18900	1880.0	22.7	21.5
				19125	1902.5	22.9	21.7
			39	18675	1857.5	22.8	21.6
				18900	1880.0	22.6	21.8
				19125	1902.5	22.6	21.5
		75	0	18675	1857.5	22.5	21.4
				18900	1880.0	22.9	21.4
				19125	1902.5	22.5	21.5
	20 MHz	1	0	18700	1860.0	23.6	22.7
				18900	1880.0	23.6	22.5
				19100	1900.0	23.5	22.2
			49	18700	1860.0	23.8	22.3
				18900	1880.0	23.5	22.4
				19100	1900.0	23.4	22.8
			99	18700	1860.0	23.5	22.6
				18900	1880.0	23.9	22.9
				19100	1900.0	23.3	22.9
		50	0	18700	1860.0	22.8	21.8
				18900	1880.0	22.5	21.2
				19100	1900.0	22.4	21.2
			24	18700	1860.0	22.2	21.6
				18900	1880.0	22.4	21.6
				19100	1900.0	22.8	21.4
			50	18700	1860.0	22.4	21.7
				18900	1880.0	22.9	21.5
				19100	1900.0	22.4	21.5
		100	0	18700	1860.0	22.4	21.2
				18900	1880.0	22.6	21.4
				19100	1900.0	22.7	21.5

Band	Bandwidth	RB Size	RB Offset	Channel	Frequency	QPSK	16QAM
4	1.4 MHz	1	0	19957	1710.7	23.8	22.2
				20175	1732.5	23.7	22.6
				20393	1754.3	23.7	22.8
			3	19957	1710.7	23.6	22.8
				20175	1732.5	23.6	22.8
				20393	1754.3	23.4	22.4
			5	19957	1710.7	23.7	22.3
				20175	1732.5	23.8	22.4
				20393	1754.3	23.8	22.3
		3	0	19957	1710.7	23.5	22.3
				20175	1732.5	23.7	22.9
				20393	1754.3	23.5	22.7
			1	19957	1710.7	23.5	22.2
				20175	1732.5	23.9	22.5
				20393	1754.3	23.6	22.3
			3	19957	1710.7	23.3	22.7
				20175	1732.5	23.6	22.7
				20393	1754.3	23.6	22.5
		6	0	19957	1710.7	22.8	21.3
				20175	1732.5	22.9	21.6
				20393	1754.3	22.3	21.6
	3 MHz	1	0	19965	1711.5	23.7	22.3
				20175	1732.5	23.4	22.5
				20385	1753.5	23.4	22.3
			7	19965	1711.5	23.7	22.2
				20175	1732.5	23.6	22.8
				20385	1753.5	23.9	22.7
			14	19965	1711.5	23.7	22.6
				20175	1732.5	23.7	22.5
				20385	1753.5	23.7	22.5
		8	0	19965	1711.5	22.2	21.2
				20175	1732.5	22.7	21.5
				20385	1753.5	22.6	21.8
			7	19965	1711.5	22.8	21.7
				20175	1732.5	22.3	21.8
				20385	1753.5	22.6	21.3
			14	19965	1711.5	22.6	21.3
				20175	1732.5	22.3	21.7
				20385	1753.5	22.3	21.3
		15	0	19965	1711.5	22.2	21.3
				20175	1732.5	22.7	21.4
				20385	1753.5	22.3	21.2

Band	Bandwidth	RB Size	RB Offset	Channel	Frequency	QPSK	16QAM
4	5 MHz	1	0	19975	1712.5	23.4	22.2
				20175	1732.5	23.8	22.9
				20375	1752.5	23.6	22.9
			12	19975	1712.5	23.5	22.7
				20175	1732.5	23.3	22.5
				20375	1752.5	23.3	22.6
			24	19975	1712.5	23.4	22.3
				20175	1732.5	23.7	22.8
				20375	1752.5	23.5	22.6
		12	0	19975	1712.5	22.4	21.6
				20175	1732.5	22.5	21.3
				20375	1752.5	22.7	21.7
			6	19975	1712.5	22.5	21.8
				20175	1732.5	22.3	21.5
				20375	1752.5	22.7	21.9
			13	19975	1712.5	22.6	21.4
				20175	1732.5	22.2	21.4
				20375	1752.5	22.9	21.6
		25	0	19975	1712.5	22.3	21.2
				20175	1732.5	22.4	21.7
				20375	1752.5	22.6	21.6
	10 MHz	1	0	20000	1715.0	23.6	22.3
				20175	1732.5	23.7	22.2
				20350	1750.0	23.7	22.3
			24	20000	1715.0	23.7	22.4
				20175	1732.5	23.6	22.4
				20350	1750.0	23.3	22.3
			49	20000	1715.0	23.7	22.4
				20175	1732.5	23.9	22.6
				20350	1750.0	23.7	22.4
		25	0	20000	1715.0	22.5	21.5
				20175	1732.5	22.4	21.4
				20350	1750.0	22.2	21.8
			13	20000	1715.0	22.5	21.7
				20175	1732.5	22.8	21.5
				20350	1750.0	22.5	21.5
			25	20000	1715.0	22.7	21.4
				20175	1732.5	22.6	21.2
				20350	1750.0	22.5	21.8
		50	0	20000	1715.0	22.3	21.3
				20175	1732.5	22.5	21.7
				20350	1750.0	22.4	21.8

Band	Bandwidth	RB Size	RB Offset	Channel	Frequency	QPSK	16QAM
4	15 MHz	1	0	20025	1717.5	23.6	22.3
4	15 MHz	1	0	20175	1732.5	23.5	22.4
4	15 MHz	1	0	20325	1747.5	23.5	22.4
4	15 MHz	1	37	20025	1717.5	23.5	22.7
4	15 MHz	1	37	20175	1732.5	23.5	22.7
4	15 MHz	1	37	20325	1747.5	23.4	22.6
4	15 MHz	1	74	20025	1717.5	23.3	22.6
4	15 MHz	1	74	20175	1732.5	23.3	22.3
4	15 MHz	1	74	20325	1747.5	23.8	22.7
4	15 MHz	36	0	20025	1717.5	22.5	21.7
4	15 MHz	36	0	20175	1732.5	22.6	21.4
4	15 MHz	36	0	20325	1747.5	22.8	21.6
4	15 MHz	36	19	20025	1717.5	22.8	21.6
4	15 MHz	36	19	20175	1732.5	22.9	21.6
4	15 MHz	36	19	20325	1747.5	22.9	21.5
4	15 MHz	36	39	20025	1717.5	22.8	21.9
4	15 MHz	36	39	20175	1732.5	22.6	21.9
4	15 MHz	36	39	20325	1747.5	22.8	21.5
4	15 MHz	75	0	20025	1717.5	22.2	21.9
4	15 MHz	75	0	20175	1732.5	22.6	21.6
4	15 MHz	75	0	20325	1747.5	22.4	21.5
4	20 MHz	1	0	20050	1720.0	23.3	22.4
4	20 MHz	1	0	20175	1732.5	23.4	22.8
4	20 MHz	1	0	20300	1745.0	23.3	22.6
4	20 MHz	1	49	20050	1720.0	23.5	22.4
4	20 MHz	1	49	20175	1732.5	23.5	22.5
4	20 MHz	1	49	20300	1745.0	23.5	22.2
4	20 MHz	1	99	20050	1720.0	23.3	22.7
4	20 MHz	1	99	20175	1732.5	23.6	22.7
4	20 MHz	1	99	20300	1745.0	23.9	22.7
4	20 MHz	50	0	20050	1720.0	22.8	21.6
4	20 MHz	50	0	20175	1732.5	22.7	21.8
4	20 MHz	50	0	20300	1745.0	22.8	21.3
4	20 MHz	50	24	20050	1720.0	22.4	21.7
4	20 MHz	50	24	20175	1732.5	22.4	21.7
4	20 MHz	50	24	20300	1745.0	22.5	21.4
4	20 MHz	50	50	20050	1720.0	22.9	21.8
4	20 MHz	50	50	20175	1732.5	22.7	21.4
4	20 MHz	50	50	20300	1745.0	22.3	21.7
4	20 MHz	100	0	20050	1720.0	22.4	21.6
4	20 MHz	100	0	20175	1732.5	22.3	21.6
4	20 MHz	100	0	20300	1745.0	22.5	21.4

Band	Bandwidth	RB Size	RB Offset	Channel	Frequency	QPSK	16QAM
5	1.4 MHz	1	0	20407	824.7	23.7	22.4
				20525	836.5	23.6	22.8
				20643	848.3	23.8	22.5
			3	20407	824.7	23.5	22.4
				20525	836.5	23.6	22.4
				20643	848.3	23.7	22.3
			5	20407	824.7	23.5	22.5
				20525	836.5	23.5	22.5
				20643	848.3	23.8	22.4
		3	0	20407	824.7	23.8	22.8
				20525	836.5	23.7	22.7
				20643	848.3	23.7	22.3
			1	20407	824.7	23.5	22.8
				20525	836.5	23.6	22.7
				20643	848.3	23.3	22.9
			3	20407	824.7	23.3	22.3
				20525	836.5	23.3	22.4
				20643	848.3	23.6	22.5
		6	0	20407	824.7	22.3	21.4
				20525	836.5	22.3	21.4
				20643	848.3	22.2	21.3
	3 MHz	1	0	20415	825.5	23.6	22.2
				20525	836.5	23.3	22.5
				20635	847.5	23.6	22.8
			7	20415	825.5	23.6	22.7
				20525	836.5	23.4	22.7
				20635	847.5	23.2	22.9
			14	20415	825.5	23.6	22.4
				20525	836.5	23.8	22.3
				20635	847.5	23.5	22.4
		8	0	20415	825.5	22.6	21.4
				20525	836.5	22.2	21.5
				20635	847.5	22.8	21.4
			7	20415	825.5	22.2	21.2
				20525	836.5	22.3	21.8
				20635	847.5	22.5	21.8
			14	20415	825.5	22.5	21.4
				20525	836.5	22.3	21.3
				20635	847.5	22.9	21.4
		15	0	20415	825.5	22.8	21.7
				20525	836.5	22.5	21.5
				20635	847.5	22.7	21.6

Band	Bandwidth	RB Size	RB Offset	Channel	Frequency	QPSK	16QAM
5	5 MHz	1	0	20425	826.5	23.7	22.9
				20525	836.5	23.5	22.2
				20625	846.5	23.5	22.4
			12	20425	826.5	23.6	22.3
				20525	836.5	23.3	22.9
				20625	846.5	23.5	22.4
			24	20425	826.5	23.8	22.6
				20525	836.5	23.8	22.4
				20625	846.5	23.4	22.5
		12	0	20425	826.5	22.4	21.4
				20525	836.5	22.2	21.8
				20625	846.5	22.2	21.6
			6	20425	826.5	22.6	21.4
				20525	836.5	22.3	21.8
				20625	846.5	22.7	21.5
			13	20425	826.5	22.6	21.7
				20525	836.5	22.8	21.6
				20625	846.5	22.7	21.8
		25	0	20425	826.5	22.9	21.3
				20525	836.5	22.7	21.7
				20625	846.5	22.3	21.9
	10 MHz	1	0	20450	829.0	23.5	22.4
				50525	836.5	23.3	22.2
				20600	844.0	23.3	22.6
			24	20450	829.0	23.4	22.2
				50525	836.5	23.2	22.4
				20600	844.0	23.4	22.8
			49	20450	829.0	23.6	22.6
				50525	836.5	23.2	22.3
				20600	844.0	23.7	22.8
		25	0	20450	829.0	22.5	21.3
				50525	836.5	22.6	21.2
				20600	844.0	22.4	21.5
			13	20450	829.0	22.8	21.8
				50525	836.5	22.8	21.5
				20600	844.0	22.8	21.2
			25	20450	829.0	22.2	21.2
				50525	836.5	22.7	21.7
				20600	844.0	22.8	21.5
		50	0	20450	829.0	22.6	21.6
				50525	836.5	22.7	21.3
				20600	844.0	22.6	21.6

Band	Bandwidth	RB Size	RB Offset	Channel	Frequency	QPSK	16QAM
12	1.4 MHz	1	0	23017	699.7	23.8	22.5
				23095	707.5	23.7	22.5
				23173	715.3	23.4	22.5
			3	23017	699.7	23.2	22.7
				23095	707.5	23.6	22.6
				23173	715.3	23.6	22.6
			5	23017	699.7	23.5	22.3
				23095	707.5	23.9	22.6
				23173	715.3	23.4	22.6
		3	0	23017	699.7	23.7	22.8
				23095	707.5	23.9	22.7
				23173	715.3	23.3	22.9
			1	23017	699.7	23.3	22.8
				23095	707.5	23.4	22.2
				23173	715.3	23.3	22.4
			3	23017	699.7	23.6	22.5
				23095	707.5	23.9	22.5
				23173	715.3	23.5	22.7
		6	0	23017	699.7	22.6	21.4
				23095	707.5	22.7	21.7
				23173	715.3	22.6	21.2
	3 MHz	1	0	23025	700.5	23.9	22.7
				23095	707.5	23.8	22.3
				23165	714.5	23.6	22.5
			7	23025	700.5	23.3	22.6
				23095	707.5	23.5	22.8
				23165	714.5	23.5	22.3
			14	23025	700.5	23.4	22.5
				23095	707.5	23.7	22.5
				23165	714.5	23.8	22.2
		8	0	23025	700.5	22.5	21.4
				23095	707.5	22.5	21.8
				23165	714.5	22.9	21.7
			7	23025	700.5	22.8	21.3
				23095	707.5	22.7	21.7
				23165	714.5	22.5	21.3
			14	23025	700.5	22.4	21.7
				23095	707.5	22.2	21.7
				23165	714.5	22.8	21.7
		15	0	23025	700.5	22.4	21.3
				23095	707.5	22.7	21.7
				23165	714.5	22.9	21.5

Band	Bandwidth	RB Size	RB Offset	Channel	Frequency	QPSK	16QAM
12	5 MHz	1	0	23035	701.5	23.4	22.4
12	5 MHz	1	0	23095	707.5	23.8	22.4
12	5 MHz	1	0	23155	713.5	23.5	22.9
12	5 MHz	1	12	23035	701.5	23.4	22.6
12	5 MHz	1	12	23095	707.5	23.3	22.7
12	5 MHz	1	12	23155	713.5	23.7	22.2
12	5 MHz	1	24	23035	701.5	23.9	22.3
12	5 MHz	1	24	23095	707.5	23.4	22.5
12	5 MHz	1	24	23155	713.5	23.9	22.6
12	5 MHz	12	0	23035	701.5	22.9	21.4
12	5 MHz	12	0	23095	707.5	22.8	21.2
12	5 MHz	12	0	23155	713.5	22.9	21.3
12	5 MHz	12	6	23035	701.5	22.3	21.4
12	5 MHz	12	6	23095	707.5	22.4	21.6
12	5 MHz	12	6	23155	713.5	22.6	21.6
12	5 MHz	12	13	23035	701.5	22.4	21.4
12	5 MHz	12	13	23095	707.5	22.4	21.4
12	5 MHz	12	13	23155	713.5	22.5	21.9
12	5 MHz	25	0	23035	701.5	22.7	21.2
12	5 MHz	25	0	23095	707.5	22.4	21.7
12	5 MHz	25	0	23155	713.5	22.5	21.6
12	10 MHz	1	0	23060	704.0	23.8	22.8
12	10 MHz	1	0	23095	707.5	23.3	22.3
12	10 MHz	1	0	23130	711.0	23.4	22.5
12	10 MHz	1	24	23060	704.0	23.3	22.6
12	10 MHz	1	24	23095	707.5	23.5	22.6
12	10 MHz	1	24	23130	711.0	23.7	22.8
12	10 MHz	1	49	23060	704.0	23.7	22.3
12	10 MHz	1	49	23095	707.5	23.8	22.8
12	10 MHz	1	49	23130	711.0	23.9	22.8
12	10 MHz	25	0	23060	704.0	22.6	21.9
12	10 MHz	25	0	23095	707.5	22.3	21.6
12	10 MHz	25	0	23130	711.0	22.6	21.3
12	10 MHz	25	13	23060	704.0	22.8	21.8
12	10 MHz	25	13	23095	707.5	22.9	21.3
12	10 MHz	25	13	23130	711.0	22.4	21.2
12	10 MHz	25	25	23060	704.0	22.5	21.5
12	10 MHz	25	25	23095	707.5	22.4	21.7
12	10 MHz	25	25	23130	711.0	22.8	21.7
12	10 MHz	50	0	23060	704.0	22.6	21.4
12	10 MHz	50	0	23095	707.5	22.5	21.7
12	10 MHz	50	0	23130	711.0	22.6	21.8

Band	Bandwidth	RB Size	RB Offset	Channel	Frequency	QPSK	16QAM
13	5 MHz	1	0	23205	779.5	23.7	22.6
				23230	782.0	23.5	22.7
				23129	784.5	23.4	22.7
			12	23205	779.5	23.9	22.7
				23230	782.0	23.4	22.2
				23129	784.5	23.3	22.3
			24	23205	779.5	23.4	22.5
				23230	782.0	23.3	22.6
				23129	784.5	23.8	22.6
		12	0	23205	779.5	22.6	21.6
				23230	782.0	22.7	21.7
				23129	784.5	22.4	21.6
			6	23205	779.5	22.8	21.6
				23230	782.0	22.7	21.7
				23129	784.5	22.9	21.7
			13	23205	779.5	22.4	21.2
				23230	782.0	22.8	21.6
				23129	784.5	22.8	21.8
		25	0	23205	779.5	22.4	21.8
				23230	782.0	22.4	21.3
				23129	784.5	22.7	21.9
	10 MHz	1	0	23230	782.0	23.3	22.2
			24	23230	782.0	23.4	22.7
			49	23230	782.0	23.3	22.9
		25	0	23230	782.0	22.8	21.7
			13	23230	782.0	22.6	21.5
			25	23230	782.0	22.8	21.3
		50	0	23230	782.0	22.3	21.5

Table 11.1.2.2 Test Reduction Table – LTE

Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 2 1850-1910 MHz	Right Touch	18700	20 MHz	QPSK	50	24	Tested
		18900					Tested
		19100					Tested
		18700			100	0	Reduced[1]
		18900					Tested
		19100					Reduced[1]
		18700			1	0	Reduced[2]
		18900					Reduced[2]
		19100					Reduced[2]
		18700				49	Tested
		18900					Tested
		19100					Tested
		18700		16QAM	50	24	Reduced[3]
		18900					Reduced[3]
		19100					Reduced[3]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	0	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		18700				49	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	Right Tilt	18700	20 MHz	QPSK	50	24	Tested
		18900					Tested
		19100					Tested
		18700			100	0	Reduced[1]
		18900					Tested
		19100					Reduced[1]
		18700			1	0	Reduced[2]
		18900					Reduced[2]
		19100					Reduced[2]
		18700				49	Tested
		18900					Tested
		19100					Tested
		18700		16QAM	50	24	Reduced[3]
		18900					Reduced[3]
		19100					Reduced[3]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	0	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		18700				49	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 v02r05.

Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 v02r05.

Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 v02r05.

Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 2 1850-1910 MHz	Left Touch	18700	20 MHz	QPSK	50	24	Reduced[6]
		18900					Tested
		19100					Reduced[6]
		18700			100	0	Reduced[1]
		18900					Tested
		19100					Reduced[1]
		18700			1	0	Reduced[2]
		18900					Reduced[2]
		19100					Reduced[2]
		18700				49	Tested
		18900					Tested
		19100					Tested
		18700		16QAM	50	24	Reduced[3]
		18900					Reduced[3]
		19100					Reduced[3]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	0	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		18700				49	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	Left Tilt	18700	20 MHz	QPSK	50	24	Reduced[6]
		18900					Tested
		19100					Reduced[6]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	0	Reduced[2]
		18900					Reduced[2]
		19100					Reduced[2]
		18700				49	Reduced[6]
		18900					Tested
		19100					Reduced[6]
		18700		16QAM	50	24	Reduced[3]
		18900					Reduced[3]
		19100					Reduced[3]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	0	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		18700				49	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 v02r05.

Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 v02r05.

Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 v02r05.

Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 2 1850-1910 MHz	Body Front	18700	20 MHz	QPSK	50	24	Tested
		18900					Tested
		19100					Tested
		18700			100	0	Reduced[1]
		18900					Tested
		19100					Reduced[1]
		18700			1	0	Reduced[2]
		18900					Reduced[2]
		19100					Reduced[2]
		18700				49	Tested
		18900					Tested
		19100					Tested
		18700		16QAM	50	24	Reduced[3]
		18900					Reduced[3]
		19100					Reduced[3]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	0	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		18700				49	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	Body Back	18700	20 MHz	QPSK	50	24	Tested
		18900					Tested
		19100					Tested
		18700			100	0	Reduced[1]
		18900					Tested
		19100					Reduced[1]
		18700			1	0	Reduced[2]
		18900					Reduced[2]
		19100					Reduced[2]
		18700				49	Tested
		18900					Tested
		19100					Tested
		18700		16QAM	50	24	Reduced[3]
		18900					Reduced[3]
		19100					Reduced[3]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	0	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		18700				49	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 v02r05.

Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 v02r05.

Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 v02r05.

Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 4 1710-1755 MHz	Right Touch	18700	20 MHz	QPSK	50	24	Reduced[6]
		18900					Tested
		19100					Reduced[6]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	0	Reduced[2]
		18900					Reduced[2]
		19100					Reduced[2]
		18700				49	Reduced[6]
		18900					Tested
		19100					Reduced[6]
		18700		16QAM	50	24	Reduced[3]
		18900					Reduced[3]
		19100					Reduced[3]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	0	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		18700				49	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	Right Tilt	18700	20 MHz	QPSK	50	24	Reduced[6]
		18900					Tested
		19100					Reduced[6]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	0	Reduced[2]
		18900					Reduced[2]
		19100					Reduced[2]
		18700				49	Reduced[6]
		18900					Tested
		19100					Reduced[6]
		18700		16QAM	50	24	Reduced[3]
		18900					Reduced[3]
		19100					Reduced[3]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	0	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		18700				49	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 v02r05.

Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 v02r05.

Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 v02r05.

Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 4 1710-1755 MHz	Left Touch	18700	20 MHz	QPSK	50	24	Reduced6
		18900					Tested
		19100					Reduced6
		18700			100	0	Reduced1
		18900					Reduced1
		19100					Reduced1
		18700			1	0	Reduced2
		18900					Reduced2
		19100					Reduced2
		18700				49	Reduced6
		18900					Tested
		19100					Reduced6
		18700		16QAM	50	24	Reduced3
		18900					Reduced3
		19100					Reduced3
		18700			100	0	Reduced1
		18900					Reduced1
		19100					Reduced1
		18700			1	0	Reduced4
		18900					Reduced4
		19100					Reduced4
		18700				49	Reduced4
		18900					Reduced4
		19100					Reduced4
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced5
	Left Tilt	18700	20 MHz	QPSK	50	24	Reduced6
		18900					Tested
		19100					Reduced6
		18700			100	0	Reduced1
		18900					Reduced1
		19100					Reduced1
		18700			1	0	Reduced2
		18900					Reduced2
		19100					Reduced2
		18700				49	Reduced6
		18900					Tested
		19100					Reduced6
		18700		16QAM	50	24	Reduced3
		18900					Reduced3
		19100					Reduced3
		18700			100	0	Reduced1
		18900					Reduced1
		19100					Reduced1
		18700			1	0	Reduced4
		18900					Reduced4
		19100					Reduced4
		18700				49	Reduced4
		18900					Reduced4
		19100					Reduced4
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced5

Reduced1 – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 v02r05.

Reduced2 - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced3 - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced4- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced5- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 v02r05.

Reduced6- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 v02r05.

Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 4 1710-1755 MHz	Body Front	18700	20 MHz	QPSK	50	24	Tested
		18900					Tested
		19100					Tested
		18700			100	0	Reduced[1]
		18900					Tested
		19100					Reduced[1]
		18700			1	0	Reduced[2]
		18900					Reduced[2]
		19100					Reduced[2]
		18700				49	Tested
		18900					Tested
		19100					Tested
		18700		16QAM	50	24	Reduced[3]
		18900					Reduced[3]
		19100					Reduced[3]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	0	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		18700				49	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	Body Back	18700	20 MHz	QPSK	50	24	Tested
		18900					Tested
		19100					Tested
		18700			100	0	Reduced[1]
		18900					Tested
		19100					Reduced[1]
		18700			1	0	Reduced[2]
		18900					Reduced[2]
		19100					Reduced[2]
		18700				49	Tested
		18900					Tested
		19100					Tested
		18700		16QAM	50	24	Reduced[3]
		18900					Reduced[3]
		19100					Reduced[3]
		18700			100	0	Reduced[1]
		18900					Reduced[1]
		19100					Reduced[1]
		18700			1	0	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		18700				49	Reduced[4]
		18900					Reduced[4]
		19100					Reduced[4]
		All lower bandwidths (15 MHz, 10 MHz, 5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 v02r05.

Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 v02r05.

Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 v02r05.

Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 5 824-849 MHz	Right Touch	20450	10 MHz	QPSK	25	13	Reduced[6]
		20525					Tested
		20600					Reduced[6]
		20450			50	0	Reduced[1]
		20525					Reduced[1]
		20600					Reduced[1]
		20450			1	0	Reduced[2]
		20525					Reduced[2]
		20600					Reduced[2]
		20450				24	Reduced[6]
		20525					Tested
		20600					Reduced[6]
		20450		16QAM	25	13	Reduced[3]
		20525					Reduced[3]
		20600					Reduced[3]
		20450			50	0	Reduced[1]
		20525					Reduced[1]
		20600					Reduced[1]
		20450			1	0	Reduced[4]
		20525					Reduced[4]
		20600					Reduced[4]
		20450				24	Reduced[4]
		20525					Reduced[4]
		20600					Reduced[4]
		All lower bandwidths (5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	Right Tilt	20450	10 MHz	QPSK	25	13	Reduced[6]
		20525					Tested
		20600					Reduced[6]
		20450			50	0	Reduced[1]
		20525					Reduced[1]
		20600					Reduced[1]
		20450			1	0	Reduced[2]
		20525					Reduced[2]
		20600					Reduced[2]
		20450				24	Reduced[6]
		20525					Tested
		20600					Reduced[6]
		20450		16QAM	25	13	Reduced[3]
		20525					Reduced[3]
		20600					Reduced[3]
		20450			50	0	Reduced[1]
		20525					Reduced[1]
		20600					Reduced[1]
		20450			1	0	Reduced[4]
		20525					Reduced[4]
		20600					Reduced[4]
		20450				24	Reduced[4]
		20525					Reduced[4]
		20600					Reduced[4]
		All lower bandwidths (5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 v02r05.

Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 v02r05.

Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 v02r05.

Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 5 824-849 MHz	Left Touch	20450	20 MHz	QPSK	25	13	Reduced[6]
		20525					Tested
		20600					Reduced[6]
		20450			50	0	Reduced[1]
		20525					Reduced[1]
		20600					Reduced[1]
		20450			1	0	Reduced[2]
		20525					Reduced[2]
		20600					Reduced[2]
		20450				24	Reduced[6]
		20525					Tested
		20600					Reduced[6]
		20450		16QAM	25	13	Reduced[3]
		20525					Reduced[3]
		20600					Reduced[3]
		20450			50	0	Reduced[1]
		20525					Reduced[1]
		20600					Reduced[1]
		20450			1	0	Reduced[4]
		20525					Reduced[4]
		20600					Reduced[4]
		20450				24	Reduced[4]
		20525					Reduced[4]
		20600					Reduced[4]
		All lower bandwidths (5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	Left Tilt	20450	20 MHz	QPSK	25	13	Reduced[6]
		20525					Tested
		20600					Reduced[6]
		20450			50	0	Reduced[1]
		20525					Reduced[1]
		20600					Reduced[1]
		20450			1	0	Reduced[2]
		20525					Reduced[2]
		20600					Reduced[2]
		20450				24	Reduced[6]
		20525					Tested
		20600					Reduced[6]
		20450		16QAM	25	13	Reduced[3]
		20525					Reduced[3]
		20600					Reduced[3]
		20450			50	0	Reduced[1]
		20525					Reduced[1]
		20600					Reduced[1]
		20450			1	0	Reduced[4]
		20525					Reduced[4]
		20600					Reduced[4]
		20450				24	Reduced[4]
		20525					Reduced[4]
		20600					Reduced[4]
		All lower bandwidths (5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 v02r05.
Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.
Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.
Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.
Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 v02r05.
Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 v02r05.

Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 5 824-849 MHz	Body Front	20450	20 MHz	QPSK	25	13	Reduced[6]
		20525					Tested
		20600					Reduced[6]
		20450			50	0	Reduced[1]
		20525					Reduced[1]
		20600					Reduced[1]
		20450			1	0	Reduced[2]
		20525					Reduced[2]
		20600					Reduced[2]
		20450				24	Reduced[6]
		20525					Tested
		20600					Reduced[6]
		20450		16QAM	25	13	Reduced[3]
		20525					Reduced[3]
		20600					Reduced[3]
		20450			50	0	Reduced[1]
		20525					Reduced[1]
		20600					Reduced[1]
		20450			1	0	Reduced[4]
		20525					Reduced[4]
		20600					Reduced[4]
		20450				24	Reduced[4]
		20525					Reduced[4]
		20600					Reduced[4]
		All lower bandwidths (5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	Body Back	20450	20 MHz	QPSK	25	13	Reduced[6]
		20525					Tested
		20600					Reduced[6]
		20450			50	0	Reduced[1]
		20525					Reduced[1]
		20600					Reduced[1]
		20450			1	0	Reduced[2]
		20525					Reduced[2]
		20600					Reduced[2]
		20450				24	Reduced[6]
		20525					Tested
		20600					Reduced[6]
		20450		16QAM	25	13	Reduced[3]
		20525					Reduced[3]
		20600					Reduced[3]
		20450			50	0	Reduced[1]
		20525					Reduced[1]
		20600					Reduced[1]
		20450			1	0	Reduced[4]
		20525					Reduced[4]
		20600					Reduced[4]
		20450				24	Reduced[4]
		20525					Reduced[4]
		20600					Reduced[4]
		All lower bandwidths (5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 v02r05.

Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 v02r05.

Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 v02r05.

Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 12 699-716 MHz	Right Touch	23060	10 MHz	QPSK	25	13	Reduced[6]
		23095					Tested
		23130					Reduced[6]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23130					Reduced[1]
		23060			1	0	Reduced[2]
		23095					Reduced[2]
		23130					Reduced[2]
		23060				24	Reduced[6]
		23095					Tested
		23130					Reduced[6]
		23060		16QAM	25	13	Reduced[3]
		23095					Reduced[3]
		23130					Reduced[3]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23130					Reduced[1]
		23060			1	0	Reduced[4]
		23095					Reduced[4]
		23130					Reduced[4]
		23060				24	Reduced[4]
		23095					Reduced[4]
		23130					Reduced[4]
		All lower bandwidths (5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	Right Tilt	23060	10 MHz	QPSK	25	13	Reduced[6]
		23095					Tested
		23130					Reduced[6]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23130					Reduced[1]
		23060			1	0	Reduced[2]
		23095					Reduced[2]
		23130					Reduced[2]
		23060				24	Reduced[6]
		23095					Tested
		23130					Reduced[6]
		23060		16QAM	25	13	Reduced[3]
		23095					Reduced[3]
		23130					Reduced[3]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23130					Reduced[1]
		23060			1	0	Reduced[4]
		23095					Reduced[4]
		23130					Reduced[4]
		23060				24	Reduced[4]
		23095					Reduced[4]
		23130					Reduced[4]
		All lower bandwidths (5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 v02r05.

Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 v02r05.

Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 v02r05.

Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 12 699-716 MHz	Left Touch	23060	20 MHz	QPSK	25	13	Reduced[6]
		23095					Tested
		23130					Reduced[6]
		23060			50	0	Reduced[1]
		23095					Tested
		23130					Reduced[1]
		23060			1	0	Reduced[2]
		23095					Reduced[2]
		23130					Reduced[2]
		23060				24	Tested
		23095					Tested
		23130					Tested
		23060		16QAM	25	13	Reduced[3]
		23095					Reduced[3]
		23130					Reduced[3]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23130					Reduced[1]
		23060			1	0	Reduced[4]
		23095					Reduced[4]
		23130					Reduced[4]
		23060				24	Reduced[4]
		23095					Reduced[4]
		23130					Reduced[4]
		All lower bandwidths (5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	Left Tilt	23060	20 MHz	QPSK	25	13	Reduced[6]
		23095					Tested
		23130					Reduced[6]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23130					Reduced[1]
		23060			1	0	Reduced[2]
		23095					Reduced[2]
		23130					Reduced[2]
		23060				24	Reduced[6]
		23095					Tested
		23130					Reduced[6]
		23060		16QAM	25	13	Reduced[3]
		23095					Reduced[3]
		23130					Reduced[3]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23130					Reduced[1]
		23060			1	0	Reduced[4]
		23095					Reduced[4]
		23130					Reduced[4]
		23060				24	Reduced[4]
		23095					Reduced[4]
		23130					Reduced[4]
		All lower bandwidths (5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 v02r05.

Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 v02r05.

Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 v02r05.

Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 12 699-716 MHz	Body Front	23060	20 MHz	QPSK	25	13	Reduced[6]
		23095					Tested
		23130					Reduced[6]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23130					Reduced[1]
		23060			1	0	Reduced[2]
		23095					Reduced[2]
		23130					Reduced[2]
		23060				24	Reduced[6]
		23095					Tested
		23130					Reduced[6]
		23060		16QAM	25	13	Reduced[3]
		23095					Reduced[3]
		23130					Reduced[3]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23130					Reduced[1]
		23060			1	0	Reduced[4]
		23095					Reduced[4]
		23130					Reduced[4]
		23060				24	Reduced[4]
		23095					Reduced[4]
		23130					Reduced[4]
		All lower bandwidths (5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]
	Body Back	23060	20 MHz	QPSK	25	13	Reduced[6]
		23095					Tested
		23130					Reduced[6]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23130					Reduced[1]
		23060			1	0	Reduced[2]
		23095					Reduced[2]
		23130					Reduced[2]
		23060				24	Reduced[6]
		23095					Tested
		23130					Reduced[6]
		23060		16QAM	25	13	Reduced[3]
		23095					Reduced[3]
		23130					Reduced[3]
		23060			50	0	Reduced[1]
		23095					Reduced[1]
		23130					Reduced[1]
		23060			1	0	Reduced[4]
		23095					Reduced[4]
		23130					Reduced[4]
		23060				24	Reduced[4]
		23095					Reduced[4]
		23130					Reduced[4]
		All lower bandwidths (5 MHz, 3 MHz, 1.4 MHz)					Reduced[5]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 v02r05.

Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.

Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 v02r05.

Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 v02r05.

Band/ Frequency (MHz)	Pos.	Required Test Channel	Bandwidth	Modulation	RB Allocation	RB Offset	Tested/ Reduced
Band 13 777-787 MHz	Right Touch	23230	10 MHz	QPSK	25	13	Tested
		23230			50	0	Reduced[1]
		23230			1	0	Reduced[2]
		23230				24	Tested
		23230		16QAM	25	13	Reduced[3]
		23230			50	0	Reduced[1]
		23230			1	0	Reduced[4]
		23230				24	Reduced[4]
		All lower bandwidths (5 MHz)					Reduced[5]
	Right Tilt	23230	10 MHz	QPSK	25	13	Tested
		23230			50	0	Reduced[1]
		23230			1	0	Reduced[2]
		23230				24	Tested
		23230		16QAM	25	13	Reduced[3]
		23230			50	0	Reduced[1]
		23230			1	0	Reduced[4]
		23230				24	Reduced[4]
		All lower bandwidths (5 MHz)					Reduced[5]
	Left Touch	23230	10 MHz	QPSK	25	13	Tested
		23230			50	0	Tested
		23230			1	0	Reduced[2]
		23230				24	Tested
		23230		16QAM	25	13	Reduced[3]
		23230			50	0	Reduced[1]
		23230			1	0	Reduced[4]
		23230				24	Reduced[4]
		All lower bandwidths (5 MHz)					Reduced[5]
	Left Tilt	23230	10 MHz	QPSK	25	13	Tested
		23230			50	0	Reduced[1]
		23230			1	0	Reduced[2]
		23230				24	Tested
		23230		16QAM	25	13	Reduced[3]
		23230			50	0	Reduced[1]
		23230			1	0	Reduced[4]
		23230				24	Reduced[4]
		All lower bandwidths (5 MHz)					Reduced[5]
	Body Front	23230	10 MHz	QPSK	25	13	Tested
		23230			50	0	Tested
		23230			1	0	Reduced[2]
		23230				24	Tested
		23230		16QAM	25	13	Reduced[3]
		23230			50	0	Reduced[1]
		23230			1	0	Reduced[4]
		23230				24	Reduced[4]
		All lower bandwidths (5 MHz)					Reduced[5]
	Body Back	23230	10 MHz	QPSK	25	13	Tested
		23230			50	0	Reduced[1]
		23230			1	0	Reduced[2]
		23230				24	Tested
		23230		16QAM	25	13	Reduced[3]
		23230			50	0	Reduced[1]
		23230			1	0	Reduced[4]
		23230				24	Reduced[4]
		All lower bandwidths (5 MHz)					Reduced[5]

Reduced[1] – If the SAR value in the 50% RB testing is less than 1.45 W/kg, the 100% RB testing is reduced per KDB941225 D05 v02r05.
Reduced[2] - If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.
Reduced[3] - If the SAR value in the 50% RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.
Reduced[4]- If the SAR value in the 1 RB testing is less than 1.45 W/kg, the remaining channels are reduced per KDB941225 D05 v02r05.
Reduced[5]- If the conducted power is within ±0.5 dB, all testing where the SAR value is less than 1.45 W/kg is reduced per KDB941225 D05 v02r05.
Reduced[6]- If the SAR value measured on the middle channel is less than 0.8 W/kg and the conducted power is within ±0.5 dB, the remaining channels are reduced per KDB941225 D05 v02r05.

Band	Mode	Bandwidth (MHz)	Channel	Frequency (MHz)	Data Rate	Avg Power (dBm)	Tune-up Pwr (dBm)
2450 MHz	802.11b	20	1	2412	1 Mbps	17.95	18.30
			6	2437		18.03	18.30
			11	2462		17.90	18.30
	802.11g	20	1	2412	6 Mbps	17.97	18.30
			6	2437		17.94	18.30
			11	2462		17.94	18.30

Test Reduction Table – 2.4 GHz

Mode	Side	Required Channel	Tested/Reduced
802.11b	Front	1 – 2412 MHz	Reduced[1]
		6 – 2437 MHz	Tested
		11 – 2462 MHz	Reduced[1]
	Back	1 – 2412 MHz	Reduced[1]
		6 – 2437 MHz	Tested
		11 – 2462 MHz	Reduced[1]
802.11g	Front	1 – 2412 MHz	Reduced[2]
		6 – 2437 MHz	Reduced[2]
		11 – 2462 MHz	Reduced[2]
	Back	1 – 2412 MHz	Reduced[2]
		6 – 2437 MHz	Reduced[2]
		11 – 2462 MHz	Reduced[2]

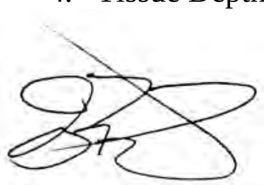
Reduced[1] – When the reported SAR is ≤ 0.4 W/kg, SAR is not required for the remaining test configuration per KDB 248227 D01 v02r02 section 5.1.1 1) page 9.

Reduced[2] – When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required per KDB 248227 D01 v02r02 section 5.2.2 2) page 10.

SAR Data Summary – 750 MHz – LTE Band 12

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	-----	Right Touch	707.5	23095	10 MHz/QPSK	1	24	0	23.5	0.625	0.70
	-----		707.5	23095	10 MHz/QPSK	25	13	1	22.9	0.506	0.52
	-----	Right Tilt	707.5	23095	10 MHz/QPSK	1	24	0	23.5	0.361	0.41
	-----		707.5	23095	10 MHz/QPSK	25	13	1	22.9	0.411	0.42
	-----	Left Touch	704.0	23060	10 MHz/QPSK	1	24	0	23.3	0.702	0.83
	1		707.5	23095	10 MHz/QPSK	1	24	0	23.5	0.748	0.84
	-----		711.0	23129	10 MHz/QPSK	1	24	0	23.7	0.739	0.79
	-----		707.5	23095	10 MHz/QPSK	25	13	1	22.9	0.465	0.48
	-----		707.5	23095	10 MHz/QPSK	50	0	1	22.5	0.431	0.48
	-----	Left Tilt	707.5	23095	10 MHz/QPSK	1	24	0	23.5	0.405	0.45
	-----		707.5	23095	10 MHz/QPSK	25	13	1	22.9	0.345	0.35
	2	Body Front	707.5	23095	10 MHz/QPSK	1	24	0	23.5	0.588	0.66
	-----		707.5	23095	10 MHz/QPSK	25	13	1	22.9	0.311	0.32
	-----	Body Back	707.5	23095	10 MHz/QPSK	1	24	0	23.5	0.512	0.57
	-----		707.5	23095	10 MHz/QPSK	25	13	1	22.9	0.422	0.43
	-----	Repeat	707.5	23095	10 MHz/QPSK	1	24	0	23.5	0.741	0.83
							Head/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

SAR Data Summary – 750 MHz – LTE Band 13

MEASUREMENT RESULTS											
Gap	Plot	Position	Frequency		BW/ Modulation	RB Size	RB Offset	MPR Target	End Power	Measured SAR	Reported SAR
			MHz	Ch.					(dBm)	(W/kg)	(W/kg)
0 mm	-----	Right Touch	782.0	23230	10 MHz/QPSK	1	24	0	23.4	0.653	0.75
	-----		782.0	23230	10 MHz/QPSK	25	13	1	22.6	0.635	0.70
	-----	Right Tilt	782.0	23230	10 MHz/QPSK	1	24	0	23.4	0.474	0.54
	-----		782.0	23230	10 MHz/QPSK	25	13	1	22.6	0.414	0.45
	3	Left Touch	782.0	23230	10 MHz/QPSK	1	24	0	23.4	0.759	0.87
	-----		782.0	23230	10 MHz/QPSK	25	13	1	22.6	0.478	0.52
	-----		782.0	23230	10 MHz/QPSK	50	0	1	22.7	0.432	0.46
	-----	Left Tilt	782.0	23230	10 MHz/QPSK	1	24	0	23.4	0.278	0.32
	-----		782.0	23230	10 MHz/QPSK	25	13	1	22.6	0.230	0.25
	4	Body Front	782.0	23230	10 MHz/QPSK	1	24	0	23.4	0.799	0.92
	-----		782.0	23230	10 MHz/QPSK	25	13	1	22.6	0.540	0.59
	-----		782.0	23230	10 MHz/QPSK	50	0	1	22.7	0.497	0.53
	-----	Body Back	782.0	23230	10 MHz/QPSK	1	24	0	23.4	0.493	0.57
	-----		782.0	23230	10 MHz/QPSK	25	13	1	22.6	0.403	0.44
	-----	Repeat	782.0	23230	10 MHz/QPSK	1	24	0	23.4	0.756	0.87
							Head/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

SAR Data Summary – 835 MHz – LTE Band 5

MEASUREMENT RESULTS											
Gap	Plot	Position	Frequency		BW/ Modulation	RB Size	RB Offset	MPR Target	End Power	Measured SAR	Reported SAR
			MHz	Ch.					(dBm)	(W/kg)	(W/kg)
0 mm	-----	Right Touch	819.0	20450	10 MHz/QPSK	1	24	0	23.4	0.639	0.73
	5		836.5	20525	10 MHz/QPSK	1	24	0	23.2	0.702	0.84
	-----		844.0	20600	10 MHz/QPSK	1	24	0	23.4	0.652	0.75
	-----		836.5	20525	10 MHz/QPSK	25	13	1	22.8	0.423	0.44
	-----		836.5	20525	10 MHz/QPSK	50	0	1	22.7	0.396	0.42
	-----	Right Tilt	836.5	20525	10 MHz/QPSK	1	24	0	23.2	0.439	0.53
	-----		836.5	20525	10 MHz/QPSK	25	13	1	22.8	0.440	0.46
	-----	Left Touch	836.5	20525	10 MHz/QPSK	1	24	0	23.2	0.433	0.52
	-----		836.5	20525	10 MHz/QPSK	25	13	1	22.8	0.210	0.22
	-----	Left Tilt	836.5	20525	10 MHz/QPSK	1	24	0	23.2	0.384	0.46
	-----		836.5	20525	10 MHz/QPSK	25	13	1	22.8	0.260	0.27
	6	Body Front	836.5	20525	10 MHz/QPSK	1	24	0	23.2	0.615	0.74
	-----		836.5	20525	10 MHz/QPSK	25	13	1	22.8	0.429	0.45
	-----	Body Back	836.5	20525	10 MHz/QPSK	1	24	0	23.2	0.500	0.60
	-----		836.5	20525	10 MHz/QPSK	25	13	1	22.8	0.411	0.43
	-----	Repeat	836.5	20525	10 MHz/QPSK	1	24	0	23.2	0.641	0.77

Head/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

SAR Data Summary – 1750 MHz – LTE Band 4

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	Right Touch	1732.5	20175	20 MHz/QPSK	1	49	0	23.5	0.635	0.71
	-----		1732.5	20175	20 MHz/QPSK	50	24	1	22.4	0.531	0.61
	-----	Right Tilt	1732.5	20175	20 MHz/QPSK	1	49	0	23.5	0.566	0.64
	-----		1732.5	20175	20 MHz/QPSK	50	24	1	22.4	0.470	0.54
	-----	Left Touch	1732.5	20175	20 MHz/QPSK	1	49	0	23.5	0.433	0.49
	-----		1732.5	20175	20 MHz/QPSK	50	24	1	22.4	0.549	0.63
	-----	Left Tilt	1732.5	20175	20 MHz/QPSK	1	49	0	23.5	0.478	0.54
	-----		1732.5	20175	20 MHz/QPSK	50	25	1	22.4	0.396	0.46
	-----	Body Front	1720.0	20050	20 MHz/QPSK	1	49	0	23.5	1.06	1.19
	-----		1732.5	20175	20 MHz/QPSK	1	49	0	23.5	1.16	1.30
	-----		1745.0	20300	20 MHz/QPSK	1	49	0	23.5	1.19	1.34
	-----		1720.0	20050	20 MHz/QPSK	50	24	1	22.4	1.04	1.19
	-----		1732.5	20175	20 MHz/QPSK	50	24	1	22.4	0.952	1.09
	-----		1745.0	20300	20 MHz/QPSK	50	24	1	22.5	1.01	1.13
	-----		1732.5	20175	20 MHz/QPSK	100	0	1	22.3	0.903	1.06
	-----	Body Back	1720.0	20050	20 MHz/QPSK	1	49	0	23.5	0.832	0.93
	-----		1732.5	20175	20 MHz/QPSK	1	49	0	23.5	0.905	1.02
	8		1745.0	20300	20 MHz/QPSK	1	49	0	23.5	0.938	1.05
	-----		1720.0	20050	20 MHz/QPSK	50	24	1	22.4	0.702	0.81
	-----		1732.5	20175	20 MHz/QPSK	50	24	1	22.4	0.738	0.85
	-----		1745.0	20300	20 MHz/QPSK	50	24	1	22.5	0.697	0.78
	-----		1732.5	20175	20 MHz/QPSK	100	0	1	22.3	0.872	1.02
	-----	Repeat	1745.0	20300	20 MHz/QPSK	1	49	0	23.5	1.17	1.31

Head/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

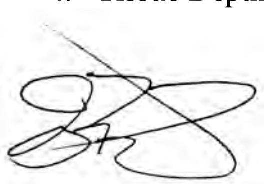
Jay M. Moulton
Vice President

SAR Data Summary – 1900 MHz – LTE Band 2

MEASUREMENT RESULTS												
Gap	**Plot**	**Position**	**Frequency**		**BW/ Modulation**	**RB Size**	**RB Offset**	**MPR Target**	**End Power**	**Measured SAR**	**Reported SAR**
			MHz	**Ch.**					**(dBm)**	**(W/kg)**	**(W/kg)**
0 mm	-----	Right Touch	1860.0	18700	20 MHz/QPSK	1	49	0	23.8	1.12	1.17
	9		1880.0	18900	20 MHz/QPSK	1	49	0	23.5	1.10	1.23
	-----		1900.0	19099	20 MHz/QPSK	1	49	0	23.4	0.999	1.15
	-----		1860.0	18700	20 MHz/QPSK	50	24	1	22.2	0.933	1.12
	-----		1880.0	18900	20 MHz/QPSK	50	24	1	22.4	0.910	1.05
	-----		1900.0	19099	20 MHz/QPSK	50	24	1	22.8	0.817	0.86
	-----		1880.0	18700	20 MHz/QPSK	100	0	1	22.6	0.719	0.79
	-----	Right Tilt	1860.0	18700	20 MHz/QPSK	1	49	0	23.8	1.02	1.07
	-----		1880.0	18900	20 MHz/QPSK	1	49	0	23.5	1.08	1.21
	-----		1900.0	19099	20 MHz/QPSK	1	49	0	23.4	1.03	1.18
	-----		1860.0	18700	20 MHz/QPSK	50	24	1	22.2	0.830	1.00
	-----		1880.0	18900	20 MHz/QPSK	50	24	1	22.4	0.831	0.95
	-----		1900.0	19099	20 MHz/QPSK	50	24	1	22.8	0.719	0.75
	-----		1880.0	18700	20 MHz/QPSK	100	0	1	22.6	0.685	0.75
	-----	Left Touch	1860.0	18700	20 MHz/QPSK	1	49	0	23.8	0.925	0.97
	-----		1880.0	18900	20 MHz/QPSK	1	49	0	23.5	0.852	0.96
	-----		1900.0	19099	20 MHz/QPSK	1	49	0	23.4	0.808	0.93
	-----		1880.0	18900	20 MHz/QPSK	50	24	1	22.4	0.704	0.81
	-----		1880.0	18900	20 MHz/QPSK	100	0	1	22.6	0.642	0.70
	-----	Left Tilt	1880.0	18900	20 MHz/QPSK	1	49	0	23.5	0.703	0.79
	-----		1880.0	18900	20 MHz/QPSK	50	24	1	22.4	0.597	0.69
	-----	Body Front	1860.0	18700	20 MHz/QPSK	1	49	0	23.8	1.41	1.48
	-----		1880.0	18900	20 MHz/QPSK	1	49	0	23.5	1.32	1.48
	-----		1900.0	19099	20 MHz/QPSK	1	49	0	23.4	1.31	1.50
	-----		1860.0	18700	20 MHz/QPSK	50	24	1	22.2	1.18	1.42
	-----		1880.0	18900	20 MHz/QPSK	50	24	1	22.4	1.25	1.44
	-----		1900.0	19099	20 MHz/QPSK	50	24	1	22.8	1.09	1.14
	-----		1880.0	18700	20 MHz/QPSK	100	0	1	22.6	0.923	1.01
	10	Body Back	1860.0	18700	20 MHz/QPSK	1	49	0	23.8	1.43	1.50
	-----		1880.0	18900	20 MHz/QPSK	1	49	0	23.5	1.33	1.49
	-----		1900.0	19099	20 MHz/QPSK	1	49	0	23.4	1.29	1.48
	-----		1860.0	18700	20 MHz/QPSK	50	24	1	22.2	1.24	1.48
	-----		1880.0	18900	20 MHz/QPSK	50	24	1	22.4	1.15	1.32
	-----		1900.0	19099	20 MHz/QPSK	50	24	1	22.8	1.09	1.14
	-----		1880.0	18700	20 MHz/QPSK	100	0	1	22.6	0.938	1.03
	-----	Repeat	1860.0	18700	20 MHz/QPSK	1	49	0	23.8	1.41	1.48

Head/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

SAR Data Summary – 2450 MHz Body 802.11b

MEASUREMENT RESULTS								
Plot	**Gap**	**Position**	**Frequency**		**Modulation**	**End Power**	**Measured SAR (W/kg)**	**Reported SAR (W/kg)**
			MHz	**Ch.**		**(dBm)**		
11	0 mm	Front	2437	6	DSSS	18.03	0.0743	0.08
-----		Back	2437	6	DSSS	18.03	0.0344	0.04

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

1. Battery is fully charged for all tests.
   Power Measured ☒Conducted ☐ERP ☐EIRP
2. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
3. Test Signal Call Mode ☒Test Code ☐Base Station Simulator
4. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
5. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

SAR Data Summary – Simultaneous Evaluation

MEASUREMENT RESULTS – WWAN & WiFi									
Frequency		Modulation	Conf.	Frequency		Modulation	SAR$_1$	SAR$_2$	SAR Total
MHz	Ch.			MHz	Ch.				
1880	18900	QPSK	Head	2462	11	DSSS	1.23	0.11	1.36
1880	18900	QPSK	Body	2437	6	DSSS	1.50	0.08	1.58
							Head/Body 1.6 W/kg (mW/g) averaged over 1 gram		

The WiFi SAR value was calculated per KDB447498 D01 v06 section 4.2.3 b) 1) on page 14 for the head simultaneous evaluation. The measured value for the body was used for the body simultaneous evaluation.

The sum of the two transmitters is less than the limit; therefore, the simultaneous transmission meets the requirements of KDB447498 D01 v06 section 4.3.2 page 13.

MEASUREMENT RESULTS – WWAN & ISM									
Frequency		Modulation	Conf.	Frequency		Modulation	SAR$_1$	SAR$_2$	SAR Total
MHz	Ch.			MHz	Ch.				
1880	18900	QPSK	Head	433	1	FM	1.23	0.06	1.29
1880	18900	QPSK	Body	433	1	FM	1.50	0.06	1.56
							Head/Body 1.6 W/kg (mW/g) averaged over 1 gram		

The ISM SAR value was calculated per KDB447498 D01 v06 section 4.2.3 b) 1) on page 14.

The sum of the two transmitters is less than or equal to the limit; therefore, the simultaneous transmission meets the requirements of KDB447498 D01 v06 section 4.3.2 page 13.

MEASUREMENT RESULTS – WiFi & ISM									
Frequency		Modulation	Conf.	Frequency		Modulation	SAR$_1$	SAR$_2$	SAR Total
MHz	Ch.			MHz	Ch.				
2462	11	DSSS	Head	433	1	FM	0.11	0.06	0.17
2462	11	DSSS	Body	433	1	FM	0.11	0.06	0.17
							Head/Body 1.6 W/kg (mW/g) averaged over 1 gram		

The WiFi & ISM SAR value was calculated per KDB447498 D01 v06 section 4.2.3 b) 1) on page 14.

The sum of the two transmitters is less than the limit; therefore, the simultaneous transmission meets the requirements of KDB447498 D01 v06 section 4.3.2 page 13.

12. Test Equipment List

Table 12.1 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
Twin SAM Phantom	N/A	N/A	1416
ELI4 Flat Phantom	N/A	N/A	1065
Device Holder	N/A	N/A	N/A
Data Acquisition Electronics 4	01/13/2022	01/13/2021	1321
SPEAG E-Field Probe EX3DV4	04/16/2022	04/16/2021	7531
Speag Validation Dipole D750V2	07/13/2021	07/13/2018	1016
Speag Validation Dipole D900V2	07/13/2021	07/13/2018	1d044
Speag Validation Dipole D1750V2	07/20/2021	07/20/2018	1018
Speag Validation Dipole D1900V2	07/13/2021	07/13/2018	5d116
Speag Validation Dipole D2450V2	07/12/2021	07/12/2018	829
Agilent N1911A Power Meter	03/16/2022	03/16/2021	GB45100254
Agilent N1922A Power Sensor	03/17/2022	03/17/2021	MY45240464
Advantest R3261A 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
Anritsu MT8820C	07/14/2021	07/14/2020	6201176199
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 (835 MHz)	N/A	N/A	N/A
Head Equivalent Matter (1750 MHz)	N/A	N/A	N/A
Head Equivalent Matter (1900 MHz)	N/A	N/A	N/A
Head Equivalent Matter (2450 MHz)	N/A	N/A	N/A

13. Conclusion

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

Please note that the absorption and distribution of electromagnetic energy in the body is a very complex phenomena that depends on the mass, shape, and size of the body; the orientation of the body with respect to the field vectors; and, the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because innumerable factors may interact to determine the specific biological outcome of an exposure to electromagnetic fields, any protection guide shall consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [3]

14. References

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

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

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

[4] International Electrotechnical Commission, IEC 62209-2 (Edition 1.0), Human Exposure to radio frequency fields from hand-held and body mounted wireless communication devices – Human models, instrumentation, and procedures – Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz), March 2010.

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

[6] Industry Canada, RSS – 102 Issue 5 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.

Appendix A – System Validation Plots and Data

```
***********************************************************
Test Result for UIM Dielectric Parameter
Tue 08/Jun/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
0.7000        42.20  0.89   41.85  0.89
0.7040        42.18  0.89   41.822 0.894*
0.7075        42.163 0.89   41.798 0.898*
0.7100        42.15  0.89   41.78  0.90
0.7110        42.145 0.89   41.775 0.901*
0.7200        42.10  0.89   41.73  0.91
0.7300        42.05  0.89   41.66  0.91
0.7400        41.99  0.89   41.60  0.91
0.7500        41.94  0.89   41.55  0.91
0.7600        41.89  0.89   41.49  0.92
0.7700        41.84  0.89   41.43  0.92
0.7800        41.79  0.90   41.37  0.92
0.7820        41.778 0.90   41.358 0.922*
0.7900        41.73  0.90   41.31  0.93
0.8000        41.68  0.90   41.27  0.93

* value interpolated


***********************************************************
Test Result for UIM Dielectric Parameter
Wed 09/Jun/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        42.25  0.88   41.48  0.89
0.7000        42.20  0.89   41.44  0.89
0.7040        42.18  0.89   41.412 0.894*
0.7075        42.163 0.89   41.388 0.898*
0.7100        42.15  0.89   41.37  0.90
0.7110        42.145 0.89   41.365 0.901*
0.7200        42.10  0.89   41.32  0.91
0.7300        42.05  0.89   41.25  0.91
0.7400        41.99  0.89   41.19  0.91
0.7500        41.94  0.89   41.14  0.91
0.7600        41.89  0.89   41.08  0.92
0.7700        41.84  0.89   41.02  0.92
0.7800        41.79  0.90   40.96  0.92
0.7820        41.778 0.90   40.948 0.922*
0.7900        41.73  0.90   40.90  0.93

* value interpolated
```

```
************************************************************
Test Result for UIM Dielectric Parameter
Fri 04/Jun/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   41.31  0.92
0.8100        41.63  0.90   41.26  0.93
0.8200        41.58  0.90   41.2   0.94
0.8290        41.535 0.90   41.245 0.94*
0.8300        41.53  0.90   41.25  0.94
0.8350        41.515 0.905  41.235 0.945*
0.8365        41.511 0.907  41.231 0.947*
0.8400        41.50  0.91   41.22  0.95
0.8440        41.50  0.914  41.212 0.954*
0.8500        41.50  0.92   41.20  0.96
0.8600        41.50  0.93   41.18  0.97
0.8700        41.50  0.94   41.17  0.98
0.8800        41.50  0.95   41.16  0.99
0.8900        41.50  0.96   41.15  1.00
0.9000        41.50  0.97   41.14  1.01

* value interpolated


************************************************************
Test Result for UIM Dielectric Parameter
Wed 09/Jun/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   40.79  0.92
0.8100        41.63  0.90   40.74  0.93
0.8200        41.58  0.90   40.68  0.94
0.8290        41.535 0.90   40.725 0.94*
0.8300        41.53  0.90   40.73  0.94
0.8350        41.515 0.905  40.715 0.945*
0.8365        41.511 0.907  40.711 0.947*
0.8400        41.50  0.91   40.70  0.95
0.8440        41.50  0.914  40.692 0.954*
0.8500        41.50  0.92   40.68  0.96
0.8600        41.50  0.93   40.66  0.97
0.8700        41.50  0.94   40.65  0.98
0.8800        41.50  0.95   40.64  0.99
0.8900        41.50  0.96   40.63  0.99
0.9000        41.50  0.97   40.62  1.00

* value interpolated
```

****
Test Result for UIM Dielectric Parameter
Mon 07/Jun/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	39.73	1.38
1.7100	40.14	1.35	39.71	1.39
1.7200	40.13	1.35	39.69	1.40
1.7300	40.11	1.36	39.67	1.40
1.7325	40.105	1.363	39.665	1.403*
1.7400	40.09	1.37	39.65	1.41
1.7450	40.085	1.37	39.64	1.415*
1.7500	40.08	1.37	39.63	1.42
1.7600	40.06	1.38	39.61	1.43
1.7700	40.05	1.38	39.59	1.44
1.7800	40.03	1.39	39.57	1.44
1.7900	40.02	1.39	39.55	1.45

* value interpolated

****
Test Result for UIM Dielectric Parameter
Wed 09/Jun/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	39.45	1.35
1.7100	40.14	1.35	39.43	1.36
1.7200	40.13	1.35	39.41	1.37
1.7300	40.11	1.36	39.39	1.37
1.7325	40.105	1.363	39.385	1.373*
1.7400	40.09	1.37	39.37	1.38
1.7450	40.085	1.37	39.36	1.385*
1.7500	40.08	1.37	39.35	1.39
1.7600	40.06	1.38	39.33	1.40
1.7700	40.05	1.38	39.31	1.41
1.7800	40.03	1.39	39.29	1.41
1.7900	40.02	1.39	39.27	1.42

* value interpolated

****
Test Result for UIM Dielectric Parameter
Thu 03/Jun/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	39.52	1.41
1.8600	40.00	1.40	39.50	1.42
1.8700	40.00	1.40	39.48	1.43
1.8800	40.00	1.40	39.47	1.44
1.8900	40.00	1.40	39.46	1.44
1.9000	40.00	1.40	39.46	1.46
1.9100	40.00	1.40	39.44	1.47
1.9200	40.00	1.40	39.43	1.47
1.9300	40.00	1.40	39.40	1.47
1.9400	40.00	1.40	39.38	1.48

*value interpolated

****
Test Result for UIM Dielectric Parameter
Thu 10/Jun/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	39.57	1.41
1.8600	40.00	1.40	39.55	1.42
1.8700	40.00	1.40	39.53	1.42
1.8800	40.00	1.40	39.52	1.43
1.8900	40.00	1.40	39.51	1.43
1.9000	40.00	1.40	39.51	1.44
1.9100	40.00	1.40	39.49	1.45
1.9200	40.00	1.40	39.47	1.45
1.9300	40.00	1.40	39.46	1.46
1.9400	40.00	1.40	39.45	1.46

* value interpolated

```
***********************************************************
Test Result for UIM Dielectric Parameter
Fri 11/Jun/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
2.4100	39.26	1.76	38.14	1.77
2.4120	39.258	1.762	38.136	1.772*
2.4200	39.25	1.77	38.12	1.78
2.4300	39.24	1.78	38.10	1.79
2.4370	39.226	1.787	38.093	1.804*
2.4400	39.22	1.79	38.09	1.81
2.4500	39.20	1.80	38.04	1.82
2.4600	39.19	1.81	38.04	1.83
2.4620	39.186	1.812	38.036	1.832*
2.4700	39.17	1.82	38.02	1.84
2.4800	39.16	1.83	38.00	1.87

* value interpolated

RF Exposure Lab

Plot 1

DUT: Dipole 750 MHz D750V3; Type: D750V3; Serial: D750V3 - SN 1016

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 = 41.55; ρ = 1000 kg/m^3
Phantom section: Flat Section

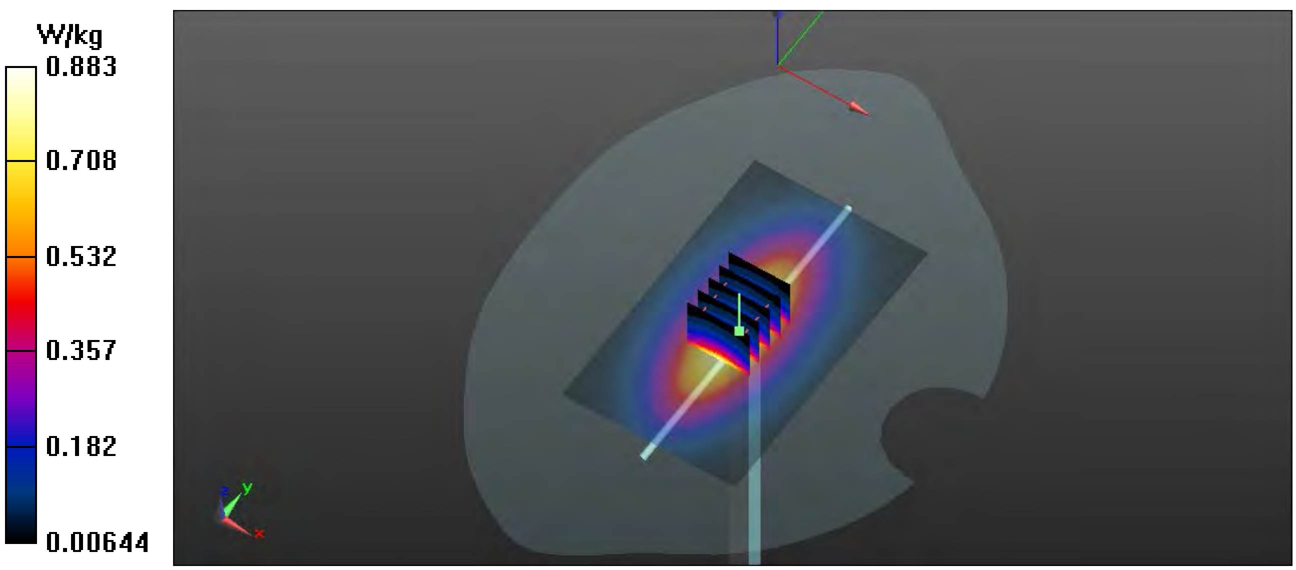
Test Date: Date: 6/8/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

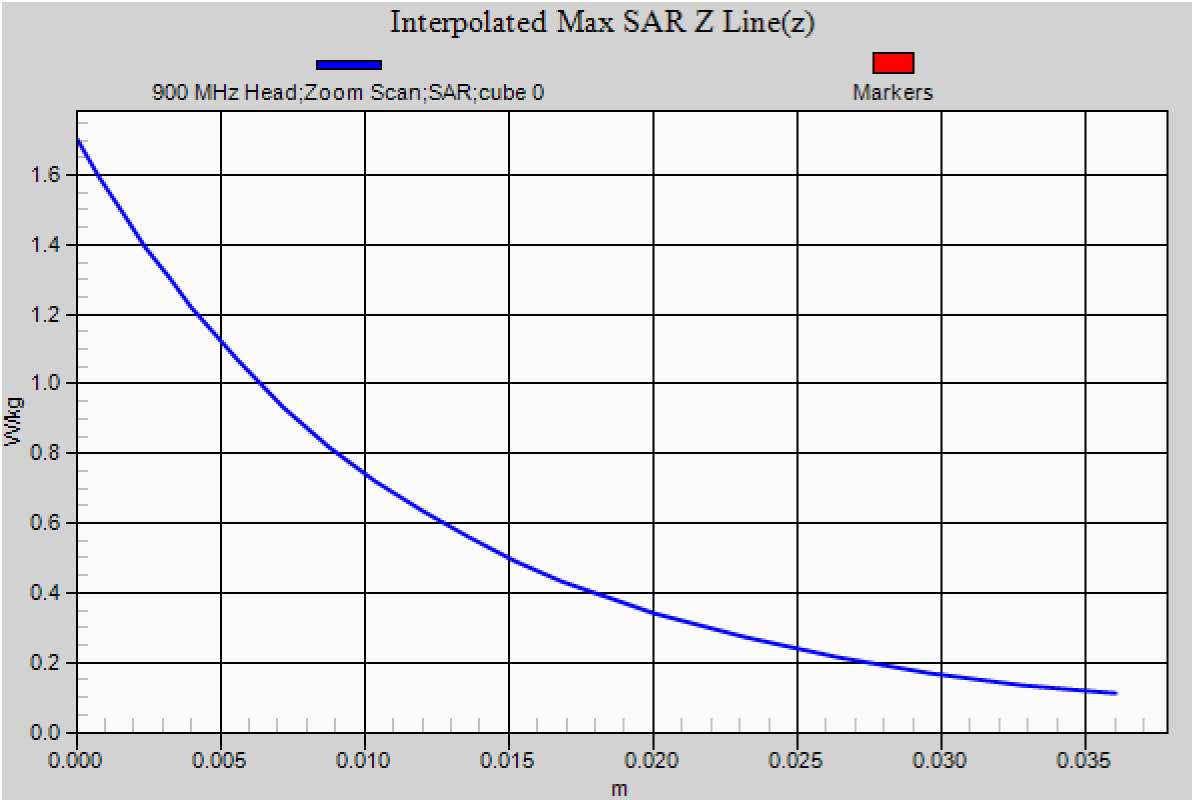
Probe: EX3DV4 – SN7531; ConvF(10.49, 10.49, 10.49); Calibrated: 4/16/2021;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

750 MHz Head/Verification/Area Scan (41x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.752 W/kg

750 MHz Head/Verification /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 35.839 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.693 mW/g
P_{in}= 100 mW
SAR(1 g) = 0.825 mW/g; SAR(10 g) = 0.539 mW/g
Maximum value of SAR (measured) = 0.883 W/kg




Interpolated Max SAR Z Line(z)
900 MHz Head;Zoom Scan;SAR;cube 0
Markers
W/kg
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

RF Exposure Lab

Plot 2

DUT: Dipole 900 MHz D900V2; Type: D900V2; Serial: D900V2 - SN:1d044

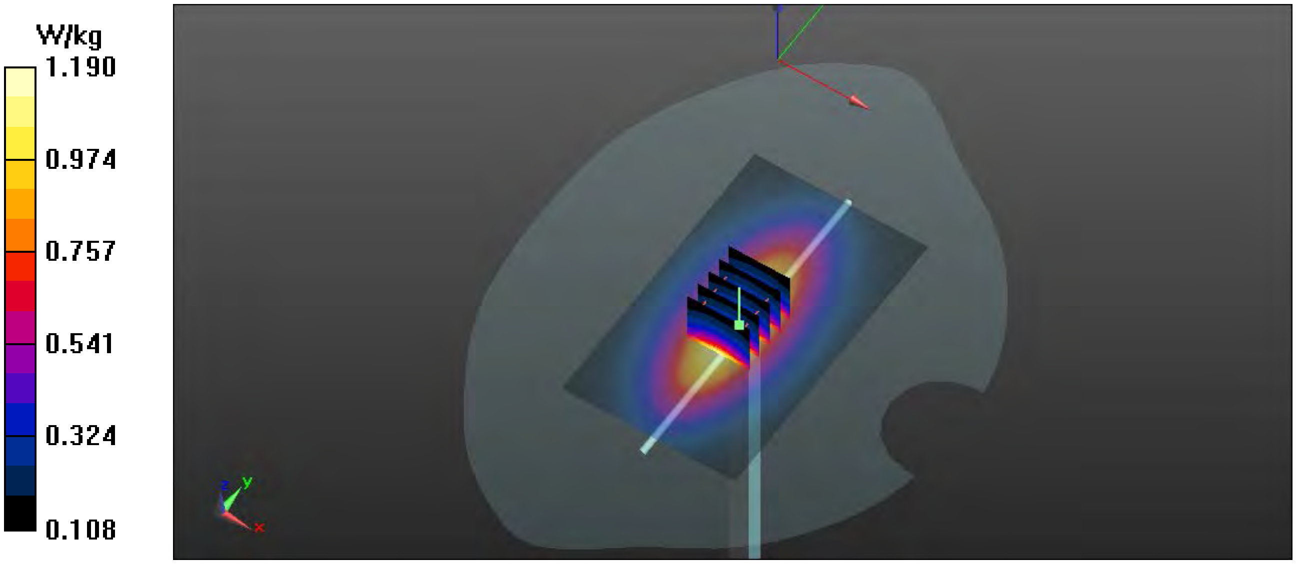
Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: HSL835; Medium parameters used: f = 900 MHz; σ = 1.01 S/m; ε_r = 41.14; ρ = 1000 kg/m^3
Phantom section: Flat Section

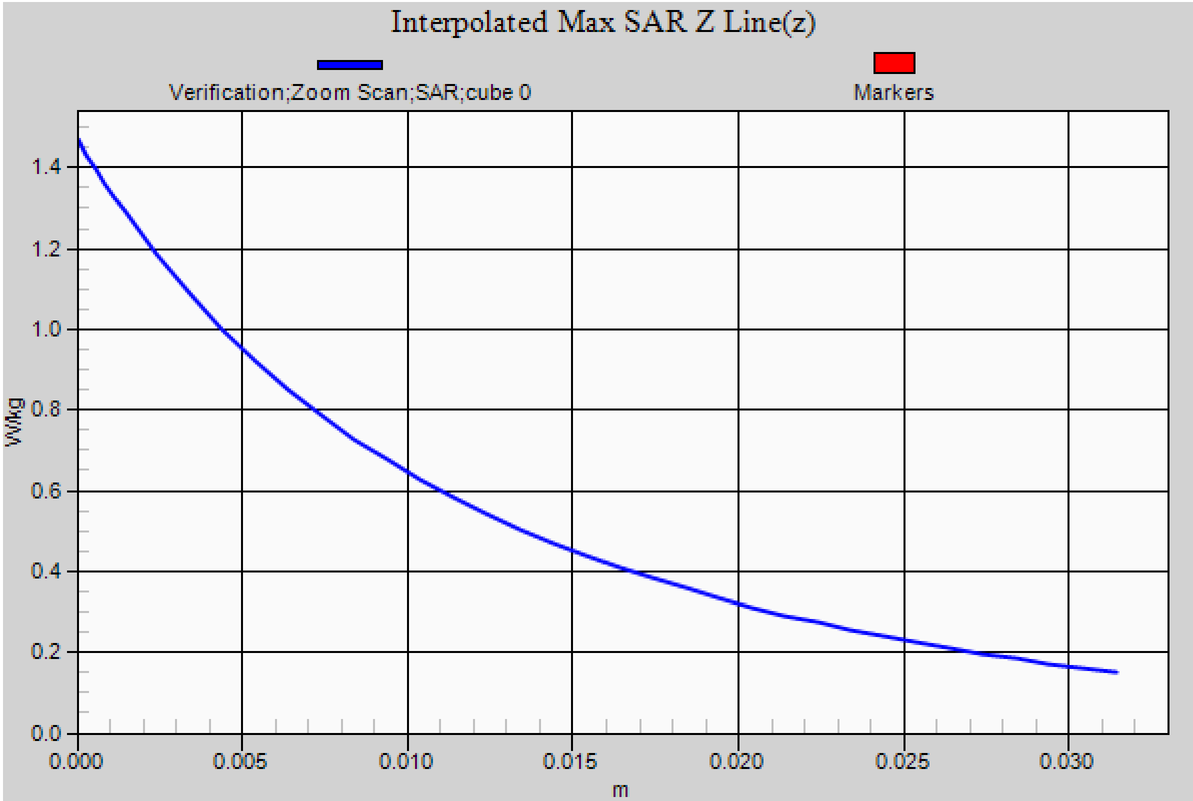
Test Date: Date: 6/4/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 – SN7531; ConvF(10.16, 10.16, 10.16); Calibrated: 4/16/2021;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

900 MHz/Verification/Area Scan (5x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.13 W/kg

900 MHz/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.125 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.46 W/kg
Pin=100 mW
SAR(1 g) = 1.13 W/kg; SAR(10 g) = 0.696 W/kg
Maximum value of SAR (measured) = 1.21 W/kg




Interpolated Max SAR Z Line(z)
Verification;Zoom Scan;SAR;cube 0
Markers
W/kg
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

RF Exposure Lab

Plot 3

DUT: Dipole 1750 MHz D1750V2; Type: D1750V2; Serial: D1750V2 - SN: 1018

Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: HSL1750; Medium parameters used: f = 1750 MHz; σ = 1.42 S/m; ε_r = 39.63; ρ = 1000 kg/m^3
Phantom section: Flat Section

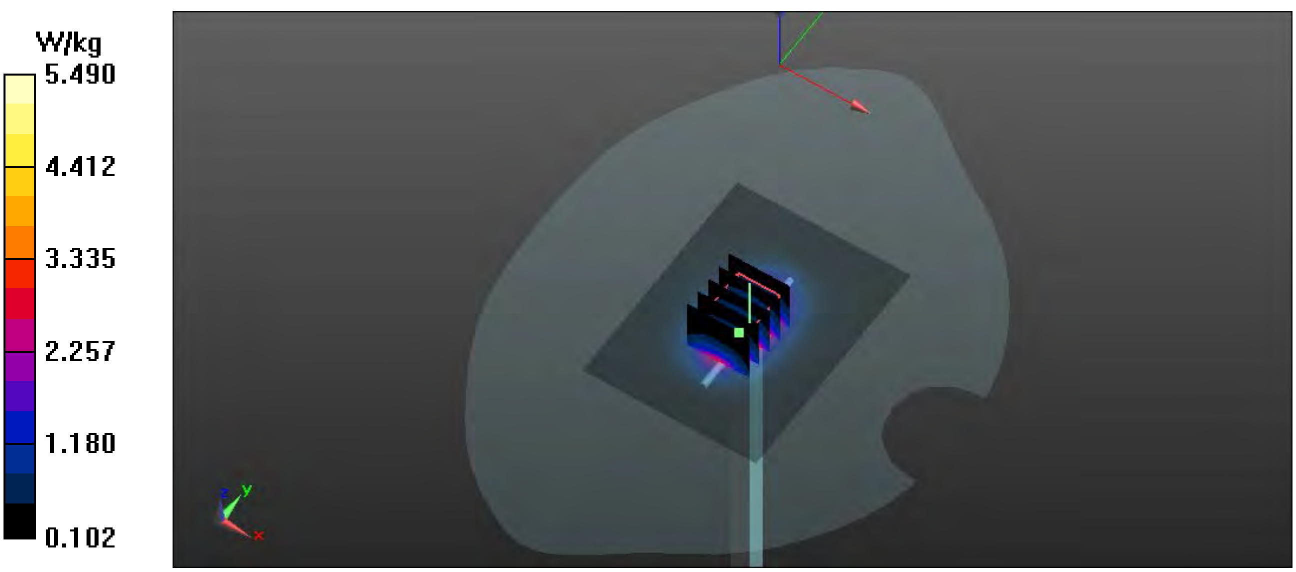
Test Date: Date: 6/7/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

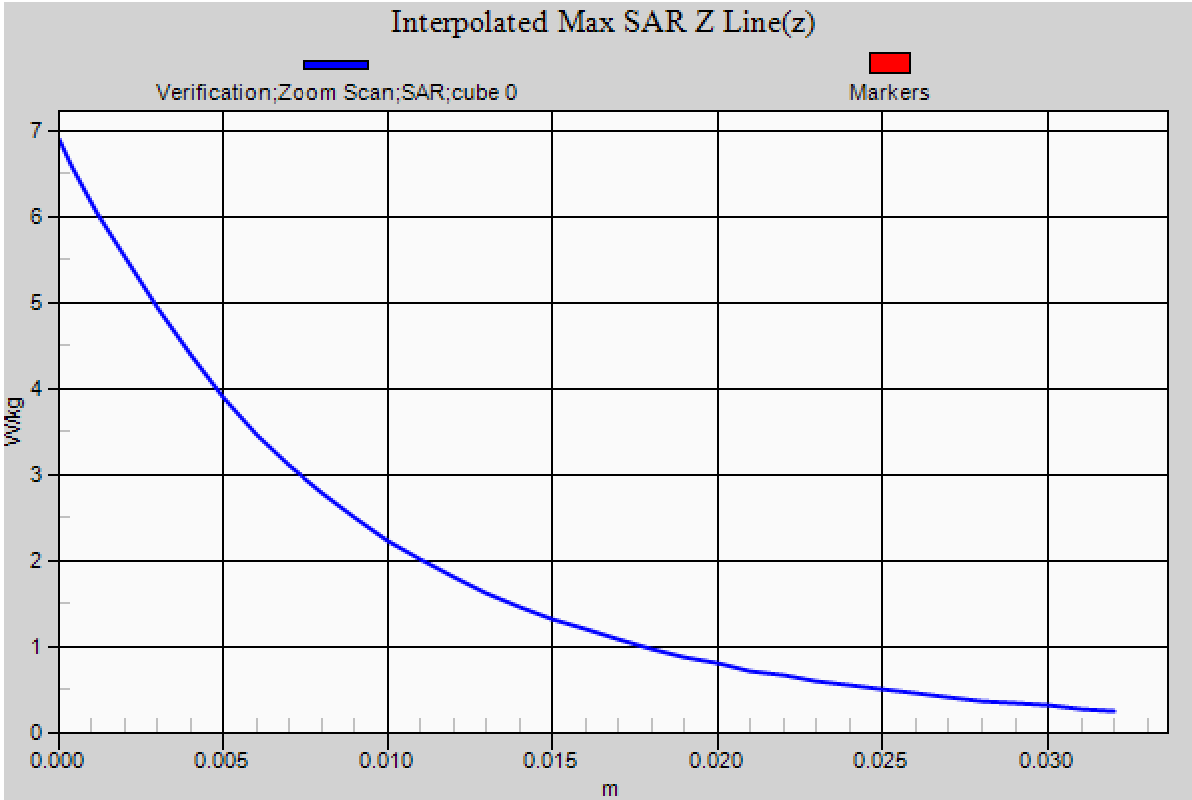
Probe: EX3DV4 – SN7531; ConvF(8.57, 8.57, 8.57); Calibrated: 4/16/2021;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

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

1750 MHz/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 35.426 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 6.88 W/kg
Pin=100 mW
SAR(1 g) = 3.67 W/kg; SAR(10 g) = 1.91 W/kg
Maximum value of SAR (measured) = 5.49 W/kg




Interpolated Max SAR Z Line(z)
Verification;Zoom Scan;SAR;cube 0
Markers
W/kg
7
6
5
4
3
2
1
0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

RF Exposure Lab

Plot 4

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN: 5d116

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL1900; Medium parameters used: f = 1900 MHz; σ = 1.46 S/m; ε_r = 39.46; ρ = 1000 kg/m^3
Phantom section: Flat Section

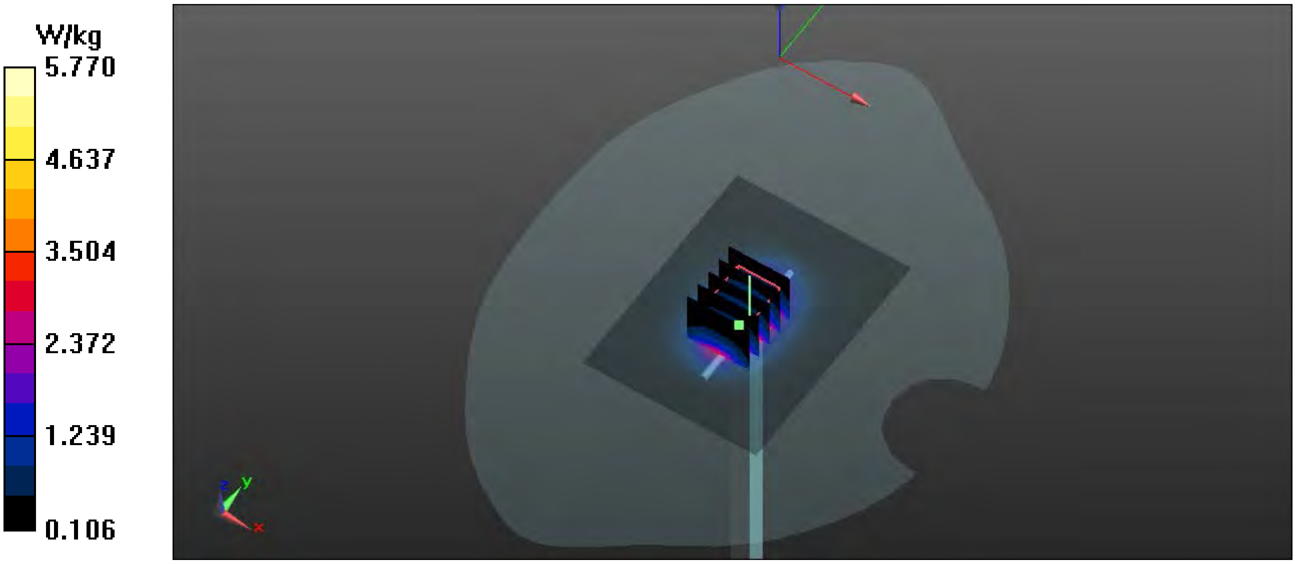
Test Date: Date: 6/3/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

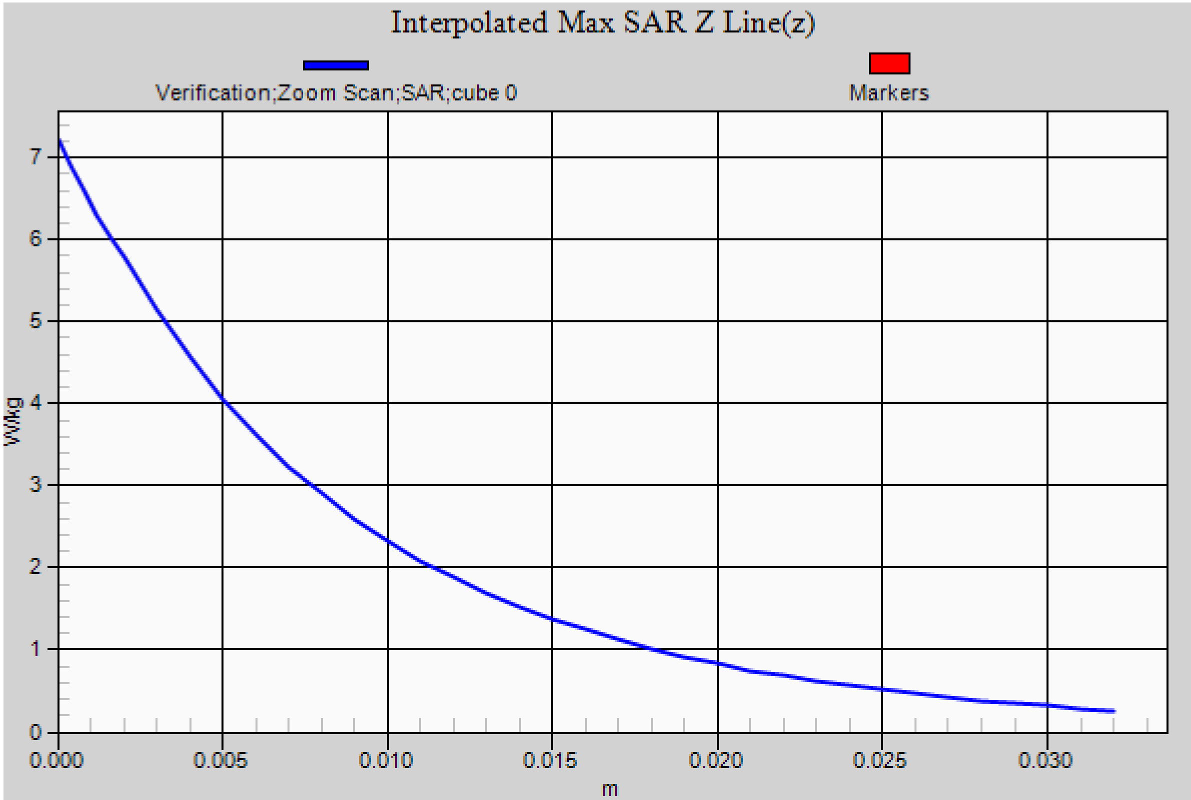
Probe: EX3DV4 – SN7531; ConvF(8.05, 8.05, 8.05); Calibrated: 4/16/2021;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

1900 MHz/Verification/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.41 W/kg

1900 MHz/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.114 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 7.18 W/kg
Pin=100 mW
SAR(1 g) = 4.10 W/kg; SAR(10 g) = 2.14 W/kg
Maximum value of SAR (measured) = 5.76 W/kg




Interpolated Max SAR Z Line(z)
Verification;Zoom Scan;SAR;cube 0
Markers
W/kg
7
6
5
4
3
2
1
0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

RF Exposure Lab

Plot 5

DUT: Dipole 750 MHz D750V3; Type: D750V3; Serial: D750V3 - SN 1016

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 = 41.14; ρ = 1000 kg/m^3
Phantom section: Flat Section

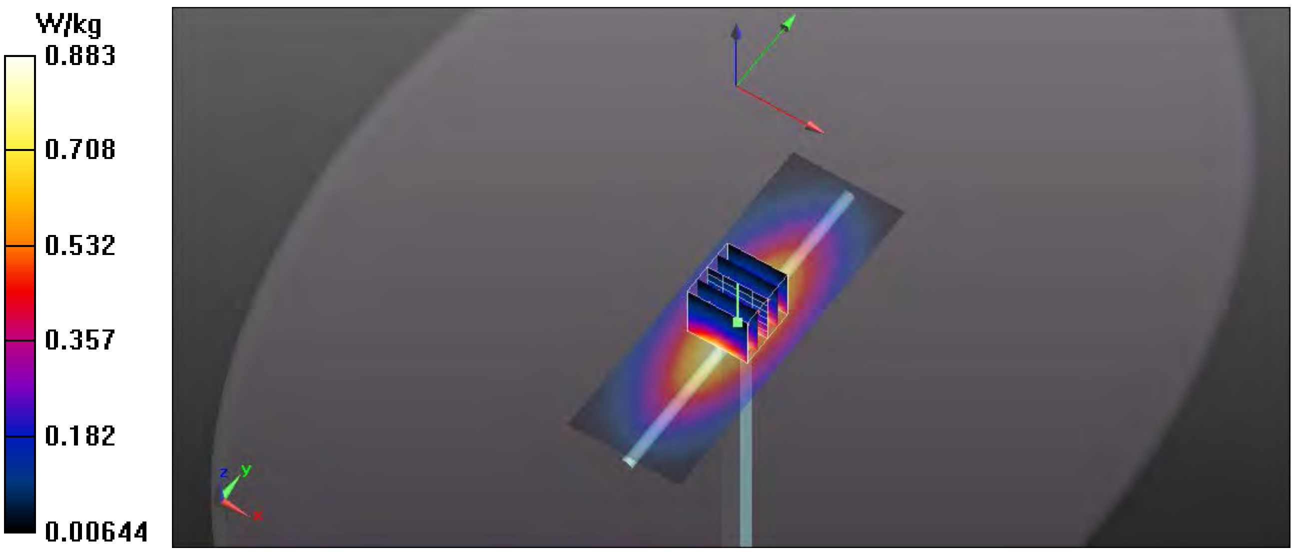
Test Date: Date: 6/9/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

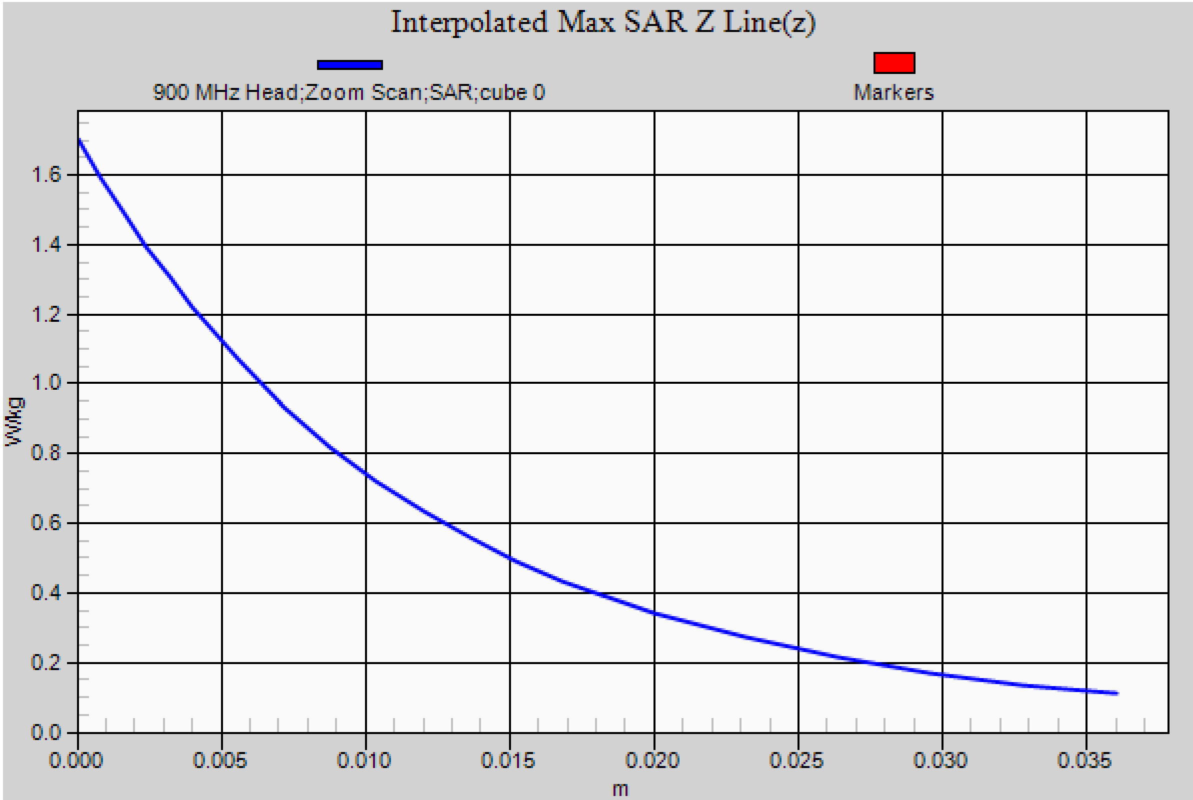
Probe: EX3DV4 – SN7531; ConvF(10.49, 10.49, 10.49); Calibrated: 4/16/2021;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

750 MHz Head/Verification/Area Scan (41x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.716 W/kg

750 MHz Head/Verification /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 34.967 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.75 W/kg
P_{in}= 100 mW
SAR(1 g) = 0.826 W/kg; SAR(10 g) = 0.537 W/kg
Maximum value of SAR (measured) = 0.885 W/kg




Interpolated Max SAR Z Line(z)
900 MHz Head;Zoom Scan;SAR;cube 0
Markers
W/kg
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

RF Exposure Lab

Plot 6

DUT: Dipole 900 MHz D900V2; Type: D900V2; Serial: D900V2 - SN:1d044

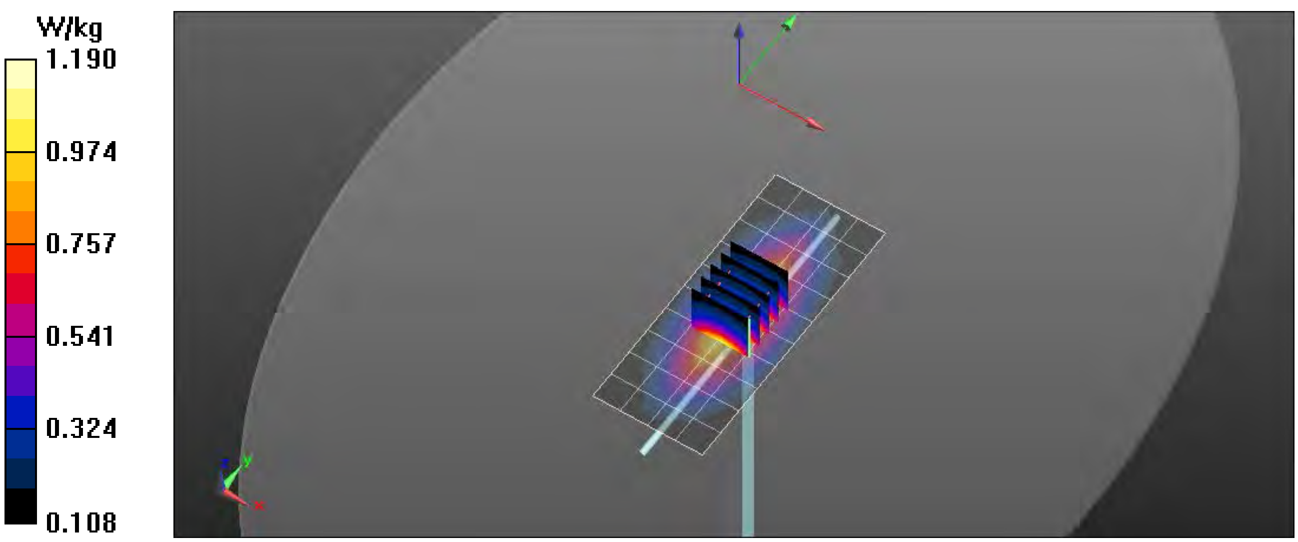
Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: HSL835; Medium parameters used: f = 900 MHz; σ = 1 S/m; ε_r = 40.62; ρ = 1000 kg/m^3
Phantom section: Flat Section

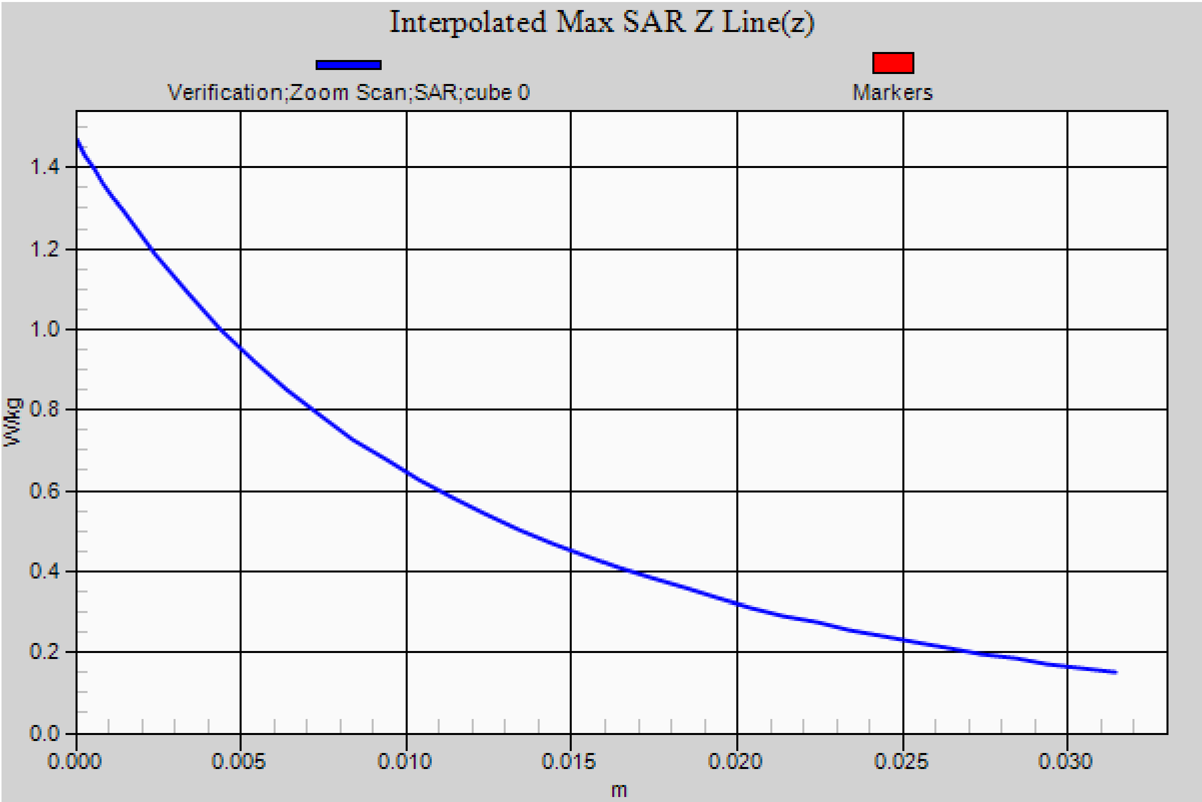
Test Date: Date: 6/9/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 – SN7531; ConvF(10.16, 10.16, 10.16); Calibrated: 4/16/2021;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

900 MHz/Verification/Area Scan (5x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.05 W/kg

900 MHz/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 35.697 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.46 W/kg
Pin=100 mW
SAR(1 g) = 1.11 W/kg; SAR(10 g) = 0.699 W/kg
Maximum value of SAR (measured) = 1.21 W/kg




Interpolated Max SAR Z Line(z)
Verification;Zoom Scan;SAR;cube 0
Markers
W/kg
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

RF Exposure Lab

Plot 7

DUT: Dipole 1750 MHz D1750V2; Type: D1750V2; Serial: D1750V2 - SN: 1018

Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: HSL1750; Medium parameters used: f = 1750 MHz; σ = 1.39 S/m; ε_r = 39.35; ρ = 1000 kg/m^3
Phantom section: Flat Section

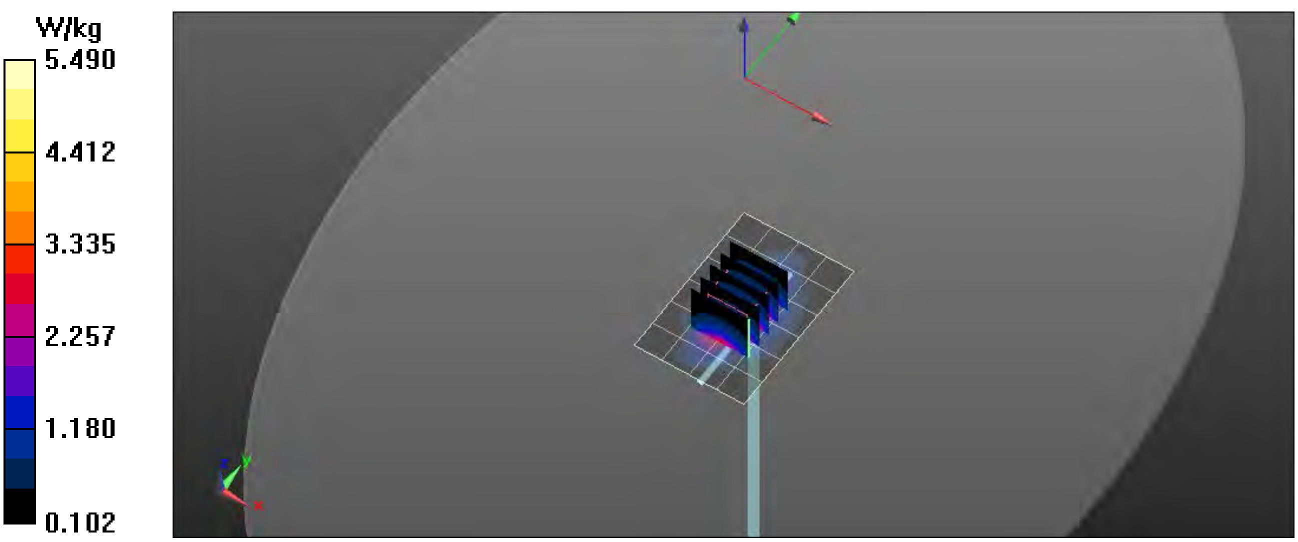
Test Date: Date: 6/9/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

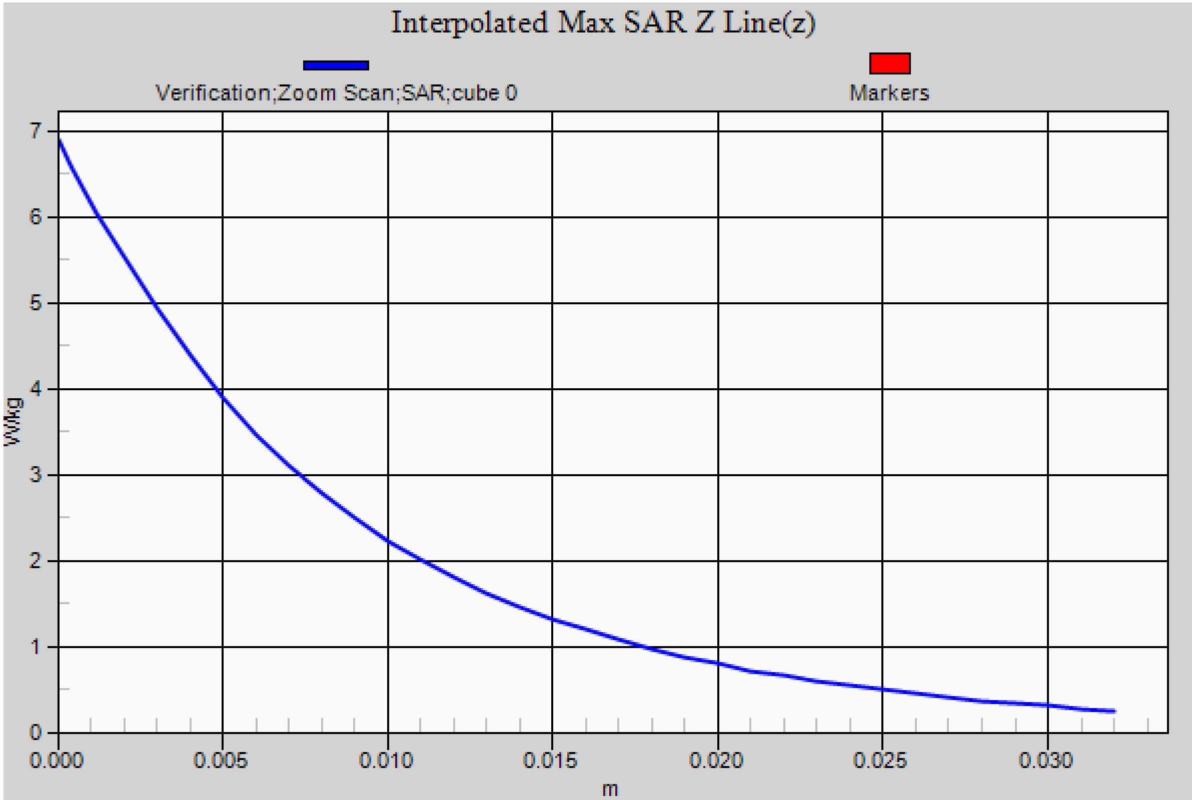
Probe: EX3DV4 – SN7531; ConvF(8.57, 8.57, 8.57); Calibrated: 4/16/2021;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

1750 MHz/Verification/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.16 W/kg

1750 MHz/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 36.927 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 6.96 W/kg
Pin=100 mW
SAR(1 g) = 3.68 W/kg; SAR(10 g) = 1.91 W/kg
Maximum value of SAR (measured) = 5.49 W/kg




Interpolated Max SAR Z Line(z)
Verification;Zoom Scan;SAR;cube 0
Markers
W/kg
7
6
5
4
3
2
1
0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

RF Exposure Lab

Plot 8

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN: 5d116

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 = 39.51; ρ = 1000 kg/m^3
Phantom section: Flat Section

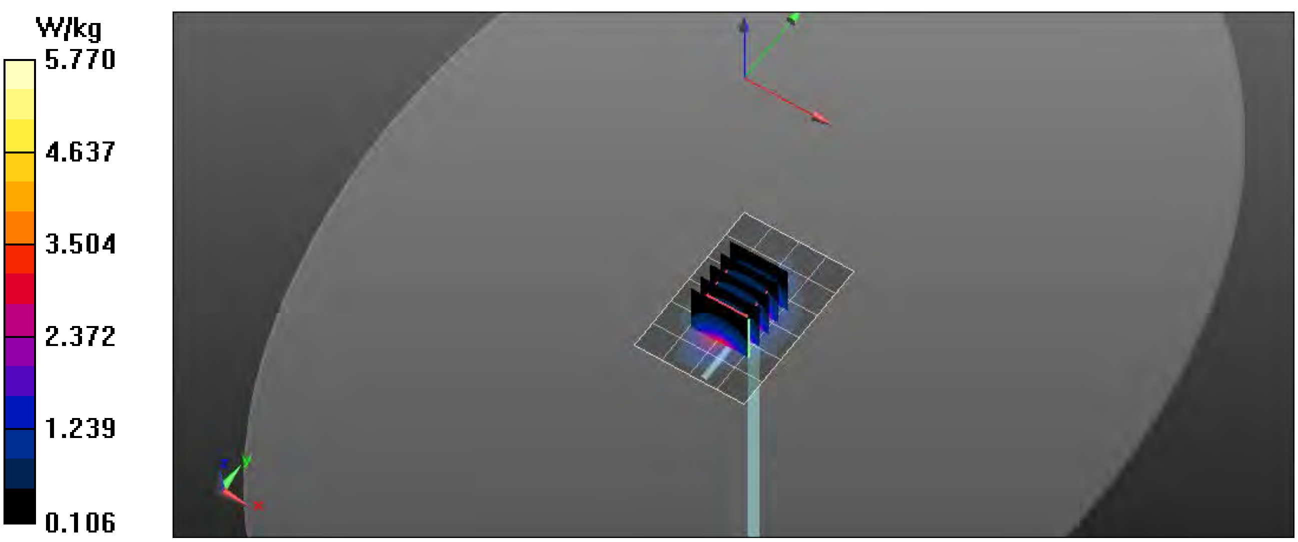
Test Date: Date: 6/10/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

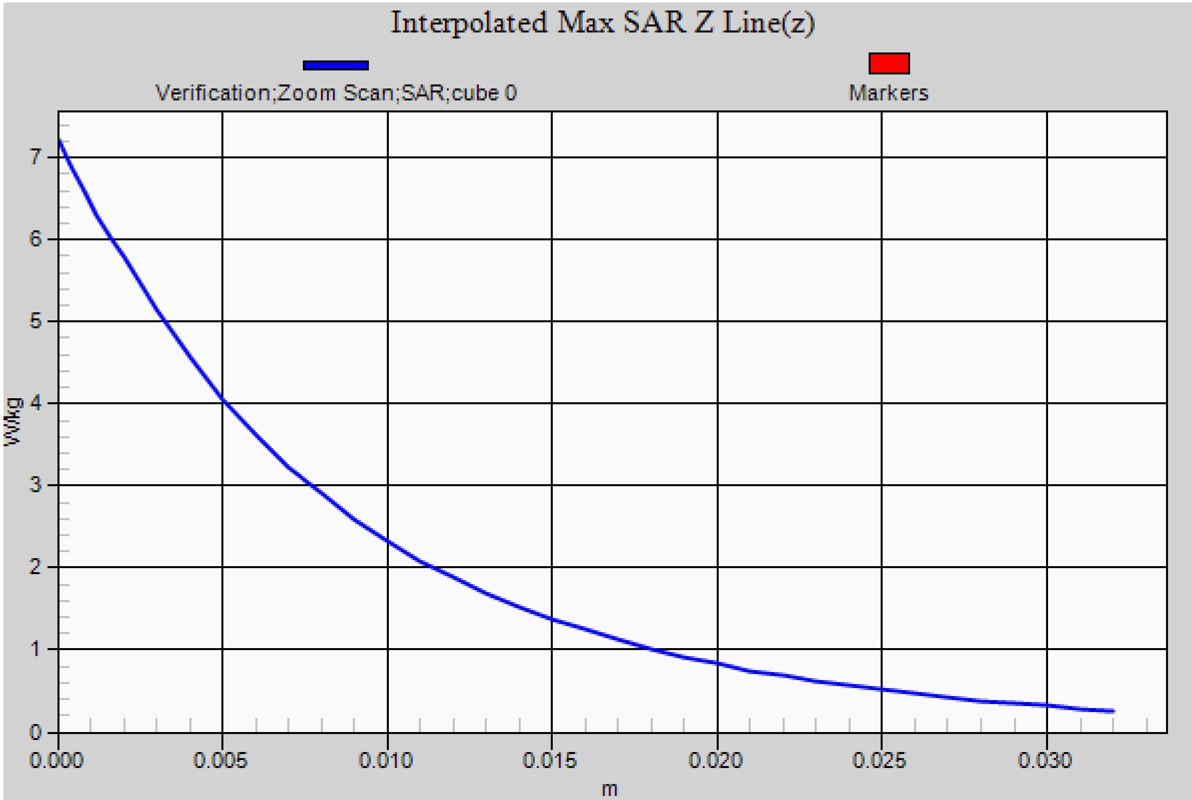
Probe: EX3DV4 – SN7531; ConvF(8.05, 8.05, 8.05); Calibrated: 4/16/2021;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

1900 MHz/Verification/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.33 W/kg

1900 MHz/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 35.628 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 7.26 W/kg
Pin=100 mW
SAR(1 g) = 4.09 W/kg; SAR(10 g) = 2.15 W/kg
Maximum value of SAR (measured) = 5.79 W/kg




Interpolated Max SAR Z Line(z)
Verification;Zoom Scan;SAR;cube 0
Markers
W/kg
0
1
2
3
4
5
6
7
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

RF Exposure Lab

Plot 9

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN: 829

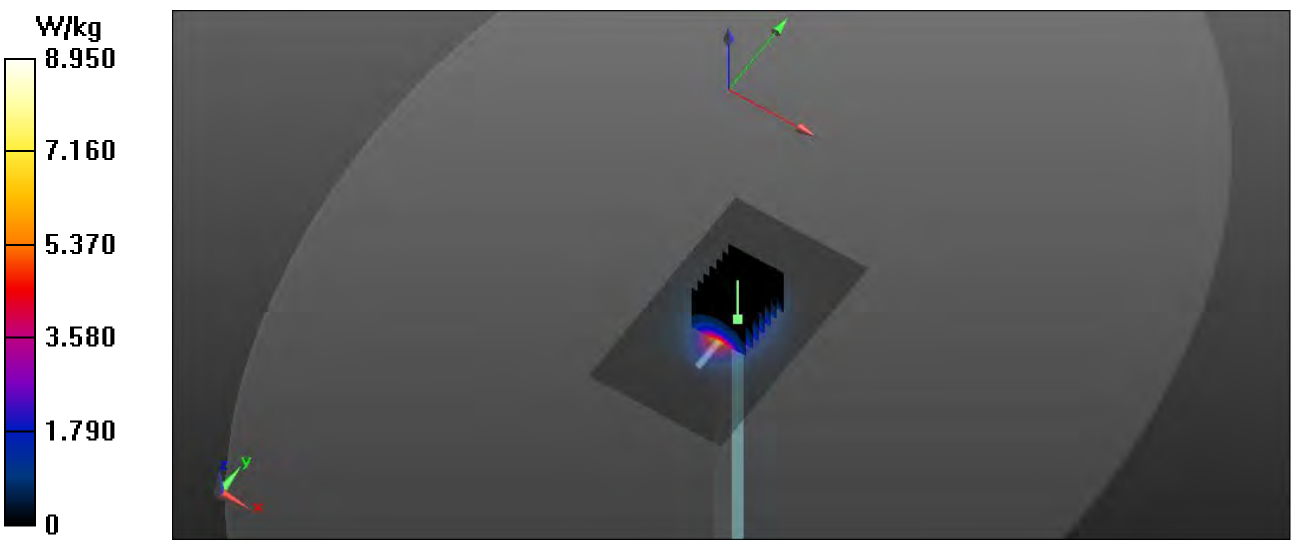
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL2450; Medium parameters used: f = 2450 MHz; σ = 1.82 S/m; ε_r = 38.04; ρ = 1000 kg/m^3
Phantom section: Flat Section

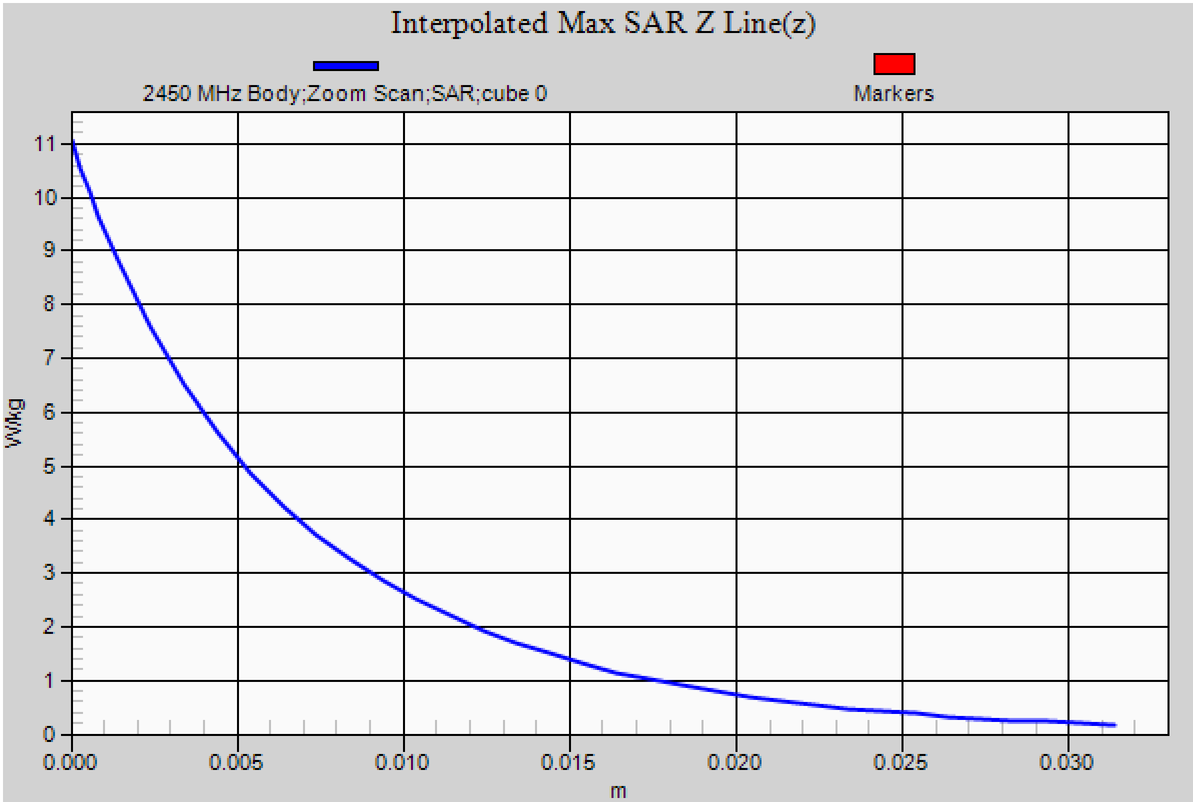
Test Date: Date: 6/11/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 – SN7531; ConvF(7.57, 7.57, 7.57); Calibrated: 4/16/2021;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

Head Verification/2450 MHz/Area Scan (61x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 8.11 W/kg

Head Verification/2450 MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.641 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 10.97 W/kg
SAR(1 g) = 5.23 W/kg; SAR(10 g) = 2.46 W/kg
Maximum value of SAR (measured) = 8.95 W/kg




Interpolated Max SAR Z Line(z)
2450 MHz Body;Zoom Scan;SAR;cube 0
Markers
W/kg
11
10
9
8
7
6
5
4
3
2
1
0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

Appendix B – SAR Test Data Plots

RF Exposure Lab

Plot 1

DUT: RTCVZ3; Type: Cellular Phone; Serial: 36090012

Communication System: LTE (SC-FDMA, 1 RB, 10 MHz, QPSK); Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: HSL750; Medium parameters used (interpolated): f = 707.5 MHz; σ = 0.898 S/m; ε_r = 41.798; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: Date: 6/8/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7531; ConvF(10.49, 10.49, 10.49); Calibrated: 4/16/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: SAM with CRP; Type: SAM; Serial: 1416
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

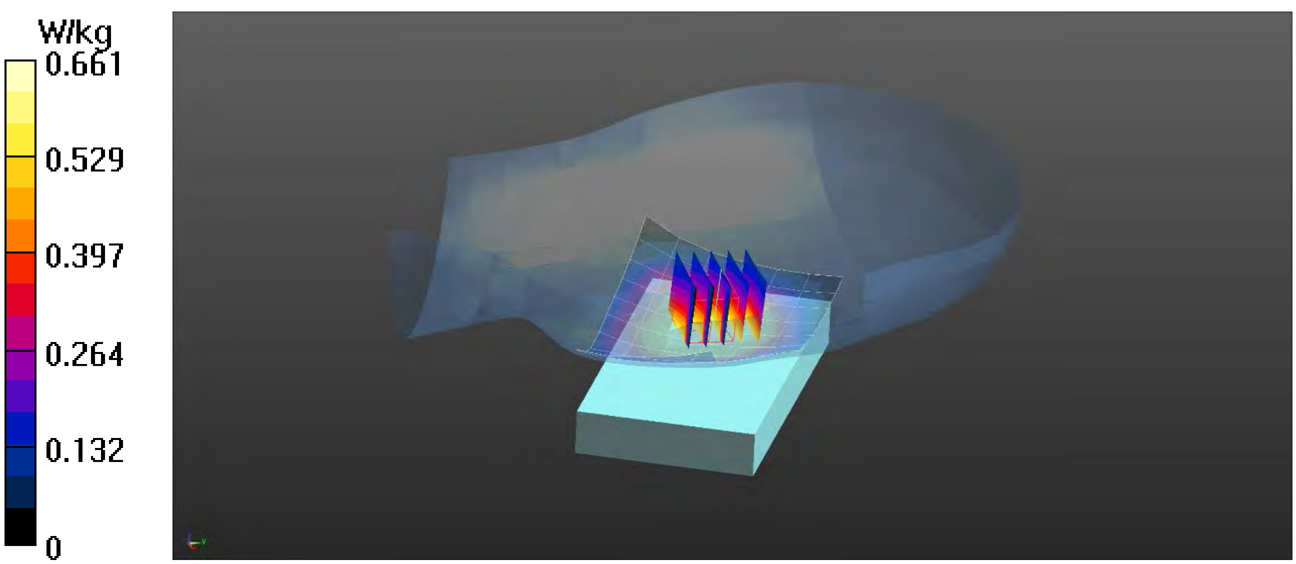
Procedure Notes:

B12 Left Head/Touch 1 RB 24 Offset Mid/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.640 W/kg

B12 Left Head/Touch 1 RB 24 Offset Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.74 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.33 W/kg
SAR(1 g) = 0.748 W/kg; SAR(10 g) = 0.472 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.661 W/kg



RF Exposure Lab

Plot 2

DUT: RTCVZ3; Type: Cellular Phone; Serial: 36090012

Communication System: LTE (SC-FDMA, 1 RB, 10 MHz, QPSK); Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: HSL750; Medium parameters used (interpolated): f = 707.5 MHz; σ = 0.898 S/m; ε_r = 41.388; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 6/9/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7531; ConvF(10.49, 10.49, 10.49); Calibrated: 4/16/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

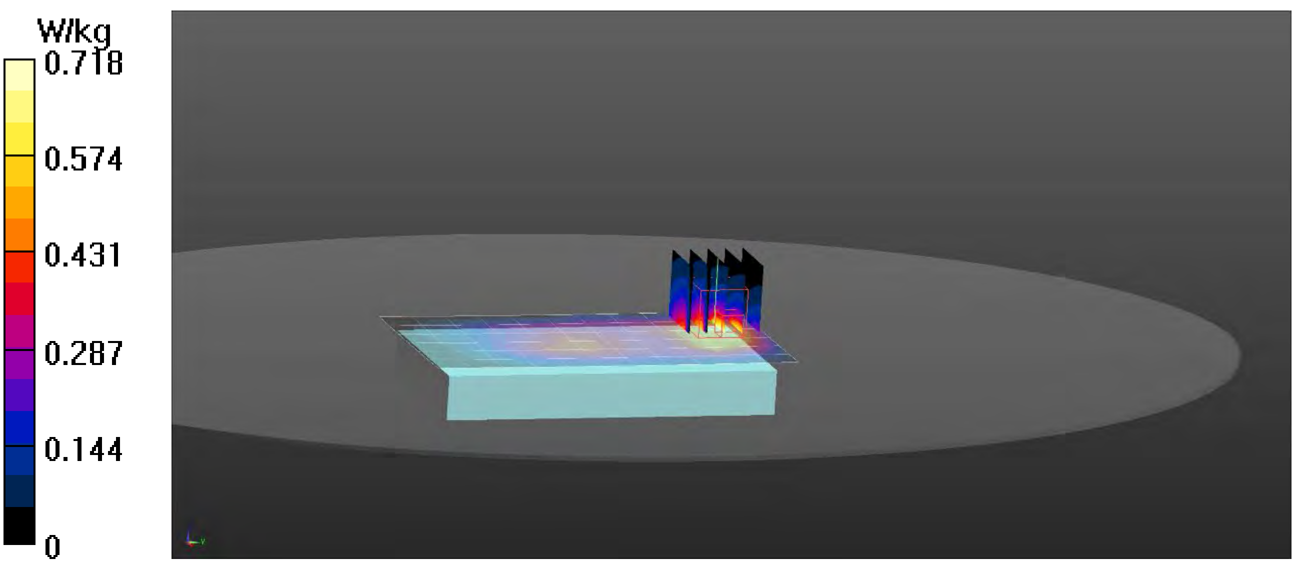
Procedure Notes:

B12 Body/Front 1 RB 24 Offset Mid/Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.735 W/kg

B12 Body/Front 1 RB 24 Offset Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.87 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.48 W/kg
SAR(1 g) = 0.588 W/kg; SAR(10 g) = 0.280 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.718 W/kg



RF Exposure Lab

Plot 3

DUT: RTCVZ3; Type: Cellular Phone; Serial: 36090012

Communication System: LTE (SC-FDMA, 1 RB, 10 MHz, QPSK); Frequency: 782 MHz; Duty Cycle: 1:1
Medium: HSL750; Medium parameters used (interpolated): f = 782 MHz; $\sigma = 0.922$ S/m; $\varepsilon_r = 41.358$; $\rho = 1000$ kg/m^3
Phantom section: Left Section

Test Date: Date: 6/8/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7531; ConvF(10.49, 10.49, 10.49); Calibrated: 4/16/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: SAM with CRP; Type: SAM; Serial: 1416
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

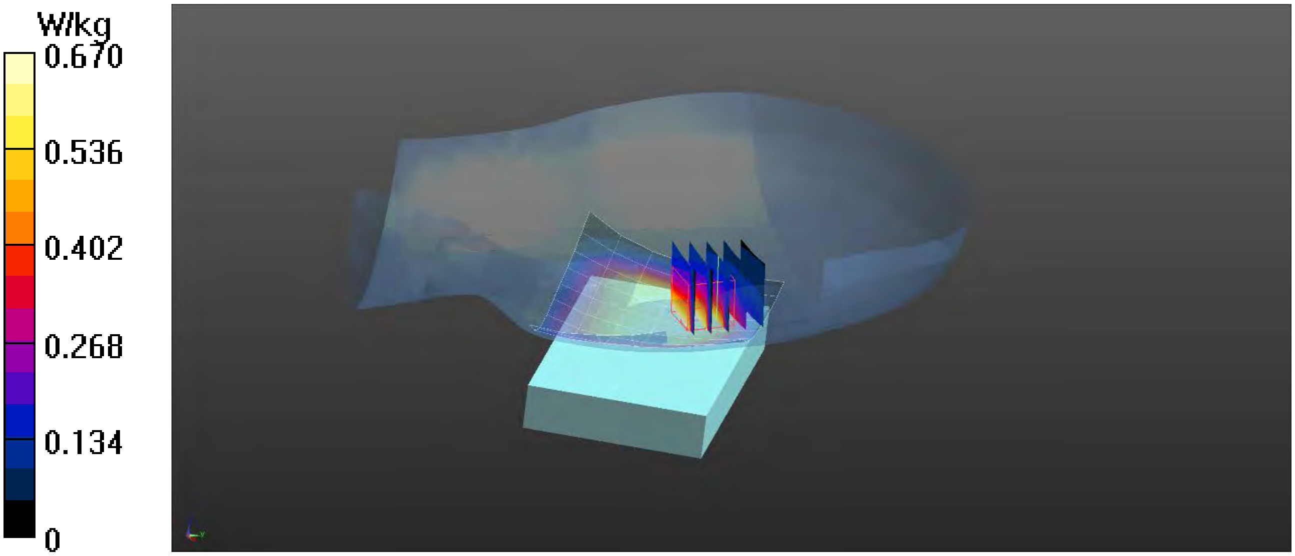
Procedure Notes:

B13 Left Head/Touch 1 RB 24 Offset Mid/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.643 W/kg

B13 Left Head/Touch 1 RB 24 Offset Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.93 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.39 W/kg
SAR(1 g) = 0.759 W/kg; SAR(10 g) = 0.419 W/kg

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



RF Exposure Lab

Plot 4

DUT: RTCVZ3; Type: Cellular Phone; Serial: 36090012

Communication System: LTE (SC-FDMA, 1 RB, 10 MHz, QPSK); Frequency: 782 MHz; Duty Cycle: 1:1
Medium: HSL750; Medium parameters used (interpolated): f = 782 MHz; σ = 0.922 S/m; ε_r = 40.948; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 6/9/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7531; ConvF(10.49, 10.49, 10.49); Calibrated: 4/16/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

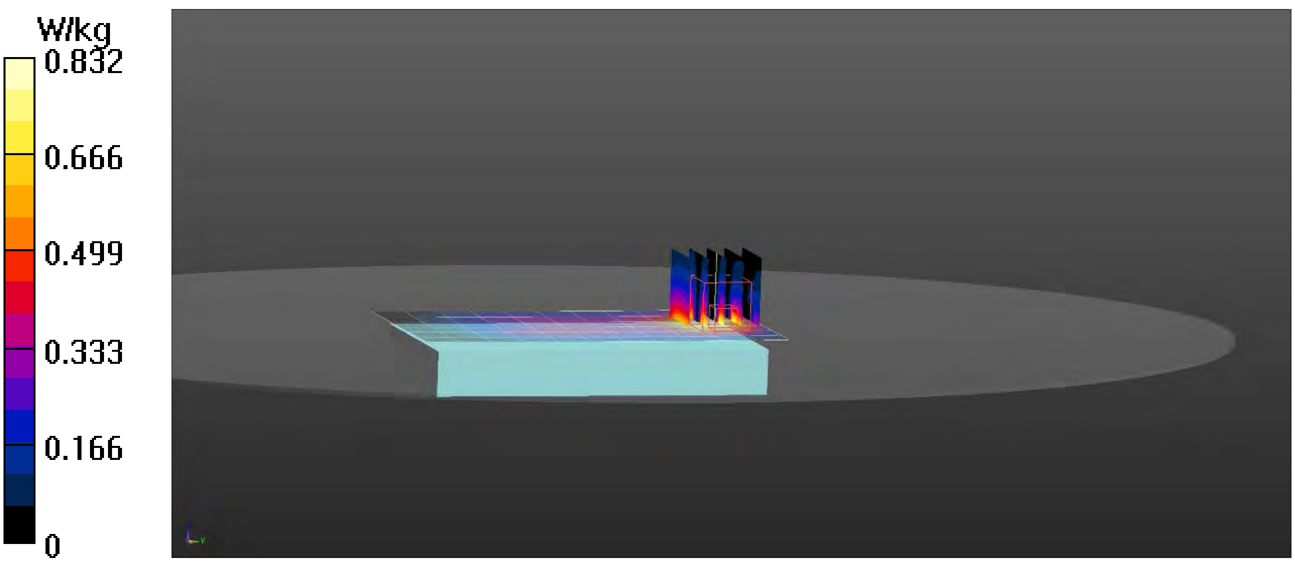
Procedure Notes:

B13 Body/Front 1 RB 24 Offset Mid/Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.900 W/kg

B13 Body/Front 1 RB 24 Offset Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.31 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.97 W/kg
SAR(1 g) = 0.799 W/kg; SAR(10 g) = 0.273 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.832 W/kg



RF Exposure Lab

Plot 5

DUT: RTCVZ3; Type: Cellular Phone; Serial: 36090012

Communication System: LTE (SC-FDMA, 1 RB, 10 MHz, QPSK); Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: HSL835; Medium parameters used (interpolated): f = 836.5 MHz; σ = 0.947 S/m; ε_r = 41.231; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: Date: 6/4/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7531; ConvF(10.16, 10.16, 10.16); Calibrated: 4/16/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: SAM with CRP; Type: SAM; Serial: 1416
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

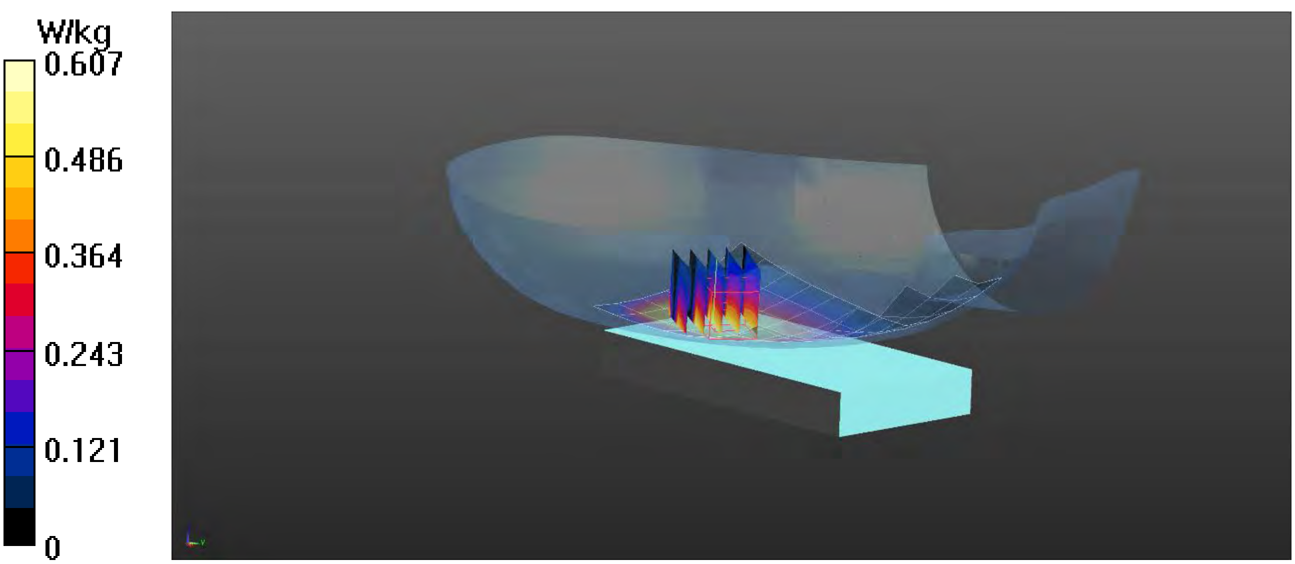
Procedure Notes:

B5 Right Head/Touch 1 RB 24 Offest Mid/Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.611 W/kg

B5 Right Head/Touch 1 RB 24 Offest Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.94 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 1.37 W/kg
SAR(1 g) = 0.702 W/kg; SAR(10 g) = 0.410 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.607 W/kg



RF Exposure Lab

Plot 6

DUT: RTCVZ3; Type: Cellular Phone; Serial: 36090012

Communication System: LTE (SC-FDMA, 1 RB, 10 MHz, QPSK); Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: HSL835; Medium parameters used (interpolated): f = 836.5 MHz; σ = 0.947 S/m; ε_r = 40.711; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 6/9/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7531; ConvF(10.16, 10.16, 10.16); Calibrated: 4/16/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

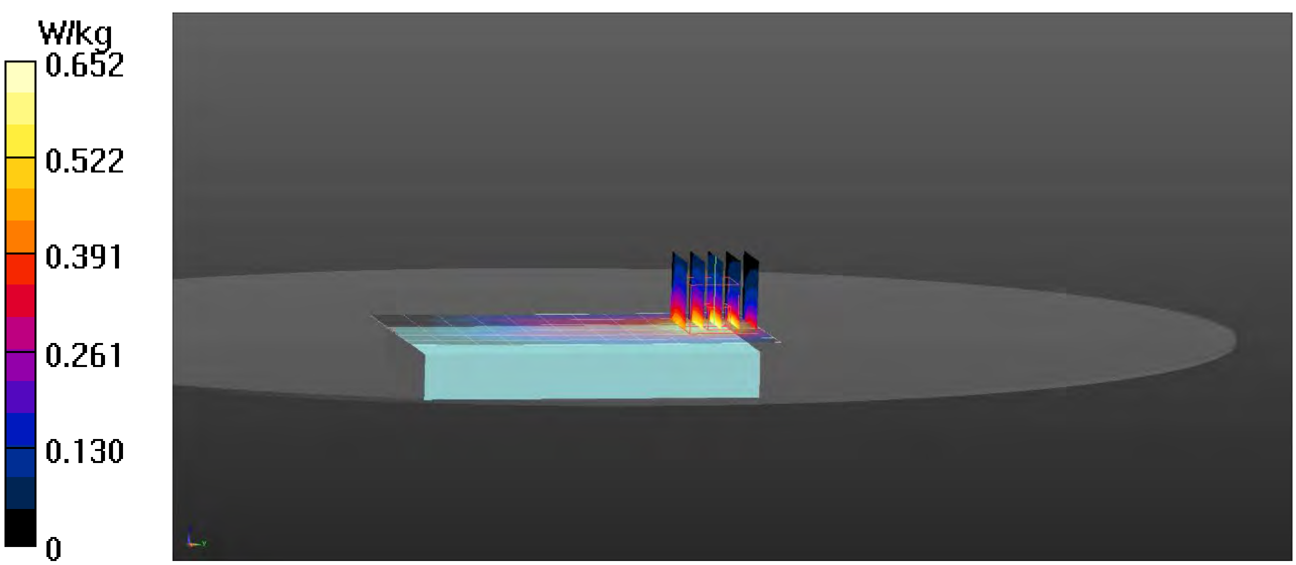
Procedure Notes:

B5 Body/Front 1 RB 24 Offset Mid/Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.661 W/kg

B5 Body/Front 1 RB 24 Offset Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.45 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.19 W/kg
SAR(1 g) = 0.615 W/kg; SAR(10 g) = 0.352 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.652 W/kg



RF Exposure Lab

Plot 7

DUT: RTCVZ3; Type: Cellular Phone; Serial: 36090012

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: HSL1750; Medium parameters used (interpolated): f = 1732.5 MHz; σ = 1.403 S/m; ε_r = 39.665; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: Date: 6/7/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7531; ConvF(8.57, 8.57, 8.57); Calibrated: 4/16/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: SAM with CRP; Type: SAM; Serial: 1416
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

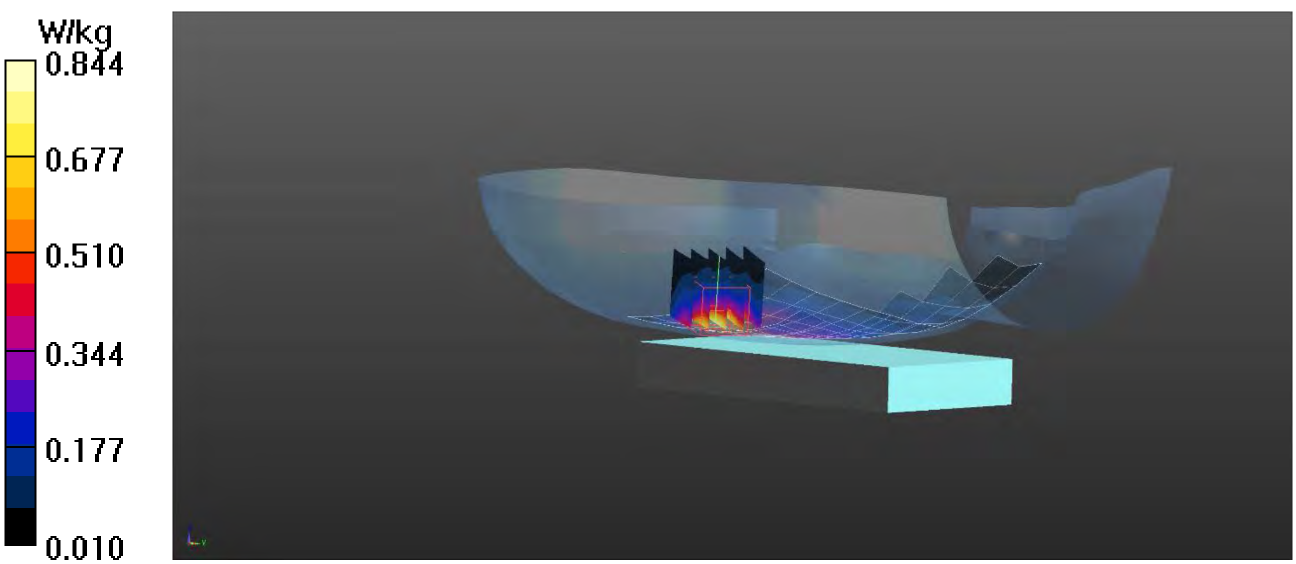
Procedure Notes:

B4 Right Head/Touch 1 RB 49 Offest Mid/Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.797 W/kg

B4 Right Head/Touch 1 RB 49 Offest Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.09 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.08 W/kg
SAR(1 g) = 0.635 W/kg; SAR(10 g) = 0.376 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.844 W/kg



RF Exposure Lab

Plot 8

DUT: RTCVZ3; Type: Cellular Phone; Serial: 36090012

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 1745 MHz; Duty Cycle: 1:1
Medium: HSL1750; Medium parameters used (interpolated): f = 1745 MHz; σ = 1.385 S/m; ε_r = 39.36; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 6/9/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7531; ConvF(8.57, 8.57, 8.57); Calibrated: 4/16/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

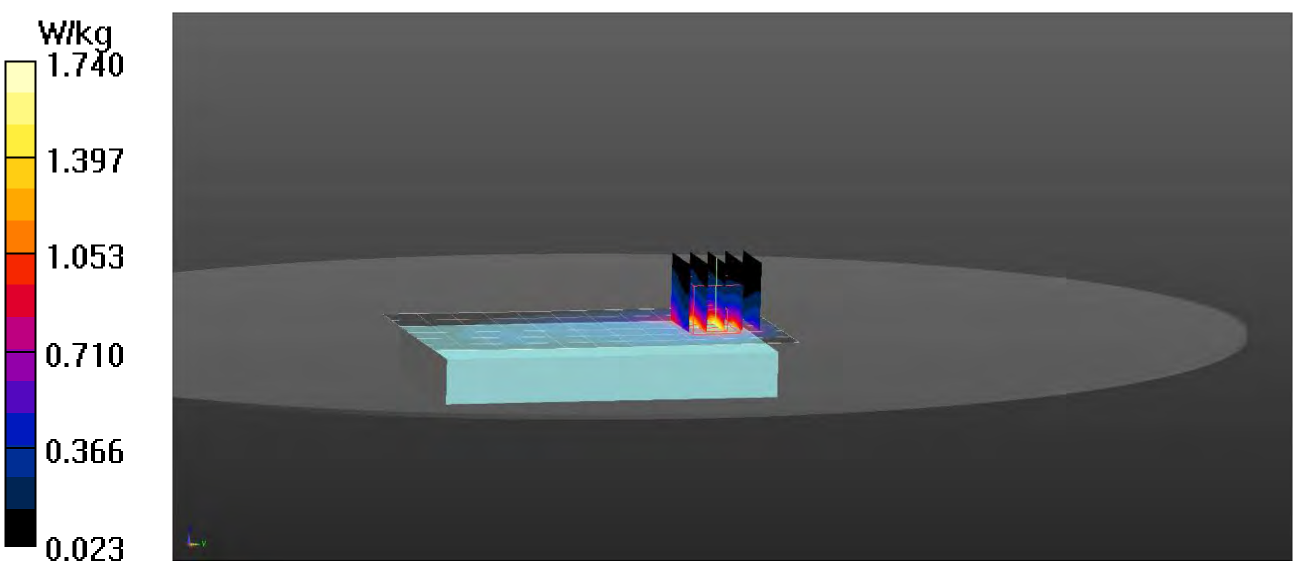
Procedure Notes:

B4 Body/Front 1 RB 49 Offset High/Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.53 W/kg

B4 Body/Front 1 RB 49 Offset High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.90 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 2.23 W/kg
SAR(1 g) = 1.19 W/kg; SAR(10 g) = 0.644 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.74 W/kg



RF Exposure Lab

Plot 9

DUT: RTCVZ3; Type: Cellular Phone; Serial: 36090012

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 1860 MHz; Duty Cycle: 1:1
Medium: HSL1900; Medium parameters used: f = 1860 MHz; σ = 1.42 S/m; ε_r = 39.5; ρ = 1000 kg/m^3
Phantom section: Right Section

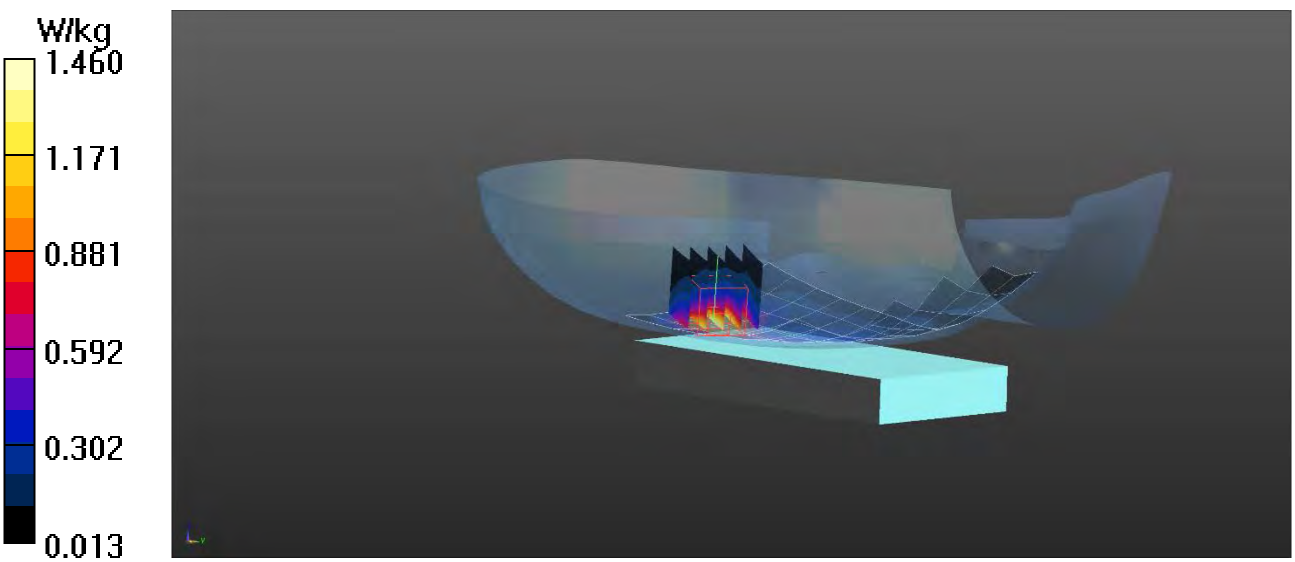
Test Date: Date: 6/3/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7531; ConvF(8.05, 8.05, 8.05); Calibrated: 4/16/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: SAM with CRP; Type: SAM; Serial: 1416
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

B2 Right Head/Touch 1 RB 49 Offset Low/Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.43 W/kg

B2 Right Head/Touch 1 RB 49 Offset Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.39 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.87 W/kg
SAR(1 g) = 1.12 W/kg; SAR(10 g) = 0.653 W/kg
Maximum value of SAR (measured) = 1.46 W/kg



RF Exposure Lab

Plot 10

DUT: RTCVZ3; Type: Cellular Phone; Serial: 36090012

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 1860 MHz; Duty Cycle: 1:1
Medium: HSL1900; Medium parameters used: f = 1860 MHz; σ = 1.42 S/m; ε_r = 39.55; ρ = 1000 kg/m^3
Phantom section: Flat Section

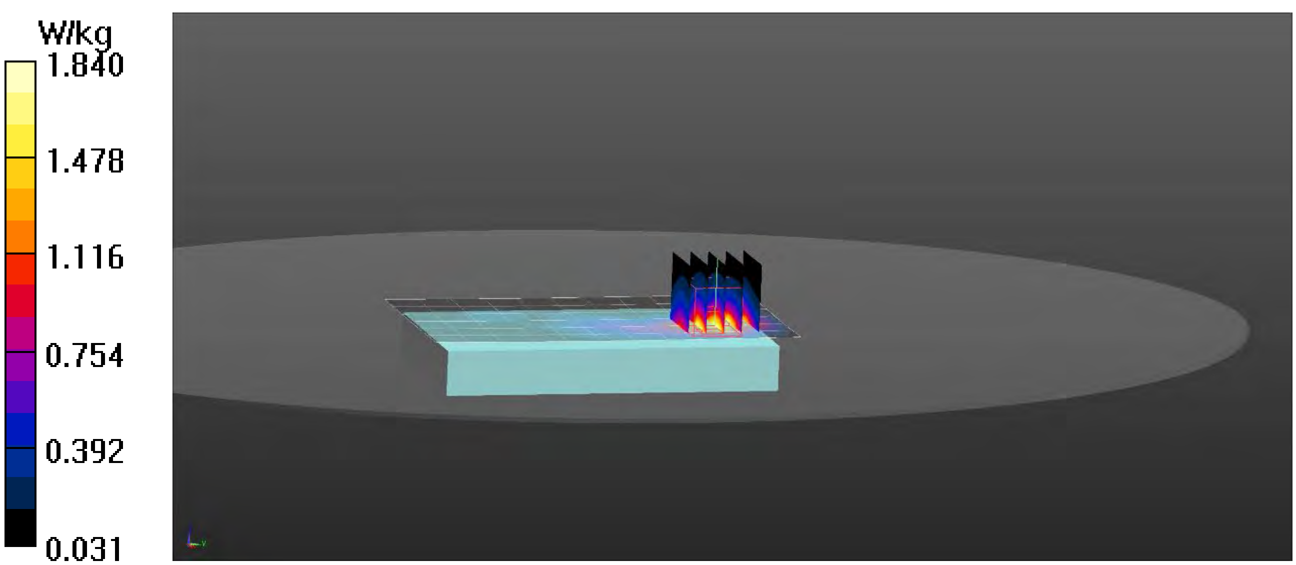
Test Date: Date: 6/10/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7531; ConvF(8.05, 8.05, 8.05); Calibrated: 4/16/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Procedure Notes:

B2 Body/Back 1 RB 49 Offset Low/Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.75 W/kg

B2 Body/Back 1 RB 49 Offset Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.86 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 2.36 W/kg
SAR(1 g) = 1.43 W/kg; SAR(10 g) = 0.781 W/kg
Maximum value of SAR (measured) = 1.84 W/kg



RF Exposure Lab

Plot 11

DUT: RTCVZ3; Type: Cellular Phone; Serial: 36090012

Communication System: WiFi 802.11b (DSSS, 1 Mbps) 4% DC; Frequency: 2437 MHz; Duty Cycle: 1:25.0035
Medium: HSL2450; Medium parameters used (interpolated): f = 2437 MHz; σ = 1.804 S/m; ε_r = 38.093; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 6/11/2021; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN7531; ConvF(7.57, 7.57, 7.57); Calibrated: 4/16/2021
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/13/2021
Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

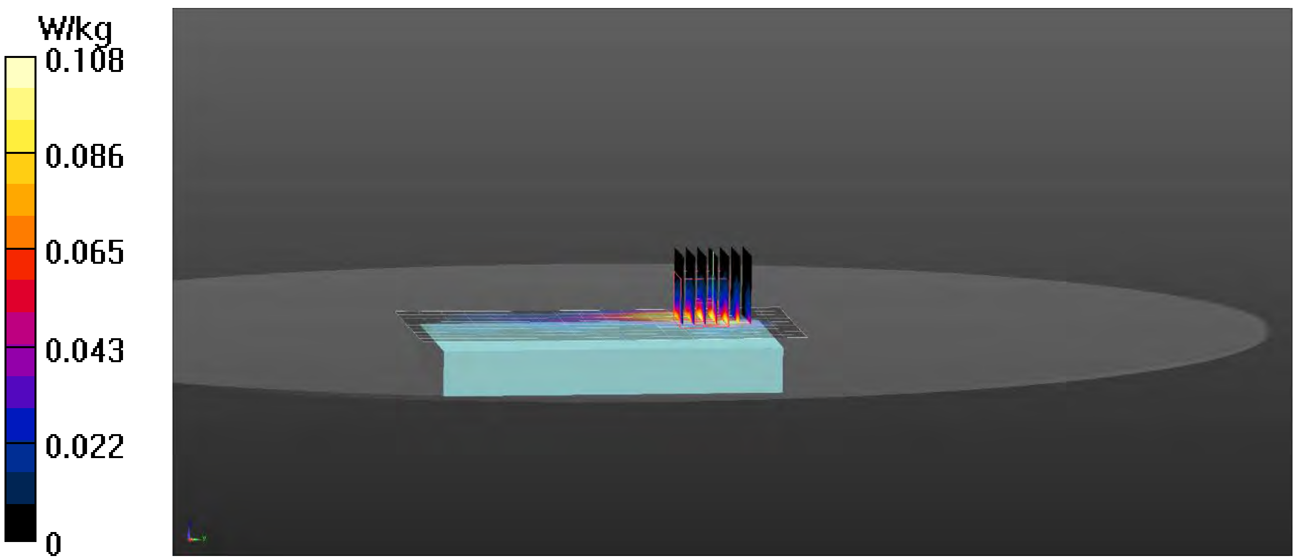
Procedure Notes:

2450 MHz Body/Front Mid/Area Scan (10x18x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.101 W/kg

2450 MHz Body/Front Mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.588 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.150 W/kg
SAR(1 g) = 0.014 W/kg; SAR(10 g) = 0.0037 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.108 W/kg



Appendix C – SAR Test Setup Photos

Test Position Right Head Touch 0 mm Gap

Test Position Right Head Tilt 0 mm Gap

Test Position Left Head Touch 0 mm Gap

Test Position Left Head Tilt 0 mm Gap

Test Position Eli Flat Front Facing Phantom 0 mm Gap

Note: Cable removed for testing.

Test Position Eli Flat Back Facing Phantom 0 mm Gap

Note: Cable removed for testing.

Front of Device

Back of Device

Appendix D – Probe Calibration Data Sheets

gm

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: EX3-7531_Apr21

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:7531

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: April 16, 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: CC2552 (20x)	09-Apr-21 (No. 217-03343)	Apr-22
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	[signature]
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: April 20, 2021

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., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 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:7531

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.39	0.47	0.40	± 10.1 %
DCP (mV)[B]	100.2	101.2	98.6	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	195.5	±3.3 %
		Y	0.0	0.0	1.0		189.5	
		Z	0.0	0.0	1.0		192.0	

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:7531

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-173.8
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:7531

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	12.89	12.89	12.89	0.00	1.00	± 13.3 %
220	49.0	0.81	12.66	12.66	12.66	0.00	1.00	± 13.3 %
300	45.3	0.87	12.09	12.09	12.09	0.10	1.30	± 13.3 %
450	43.5	0.87	11.21	11.21	11.21	0.16	1.30	± 13.3 %
600	42.7	0.88	10.64	10.64	10.64	0.10	1.25	± 13.3 %
750	41.9	0.89	10.49	10.49	10.49	0.63	0.80	± 12.0 %
900	41.5	0.97	10.16	10.16	10.16	0.54	0.80	± 12.0 %
1750	40.1	1.37	8.57	8.57	8.57	0.33	0.86	± 12.0 %
1900	40.0	1.40	8.05	8.05	8.05	0.37	0.86	± 12.0 %
2300	39.5	1.67	7.88	7.88	7.88	0.29	0.90	± 12.0 %
2450	39.2	1.80	7.57	7.57	7.57	0.37	0.90	± 12.0 %
2600	39.0	1.96	7.30	7.30	7.30	0.40	0.90	± 12.0 %
3500	37.9	2.91	6.80	6.80	6.80	0.40	1.35	± 13.1 %
3700	37.7	3.12	6.40	6.40	6.40	0.40	1.35	± 13.1 %
5250	35.9	4.71	5.19	5.19	5.19	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.65	4.65	4.65	0.40	1.80	± 13.1 %
5750	35.4	5.22	4.75	4.75	4.75	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.

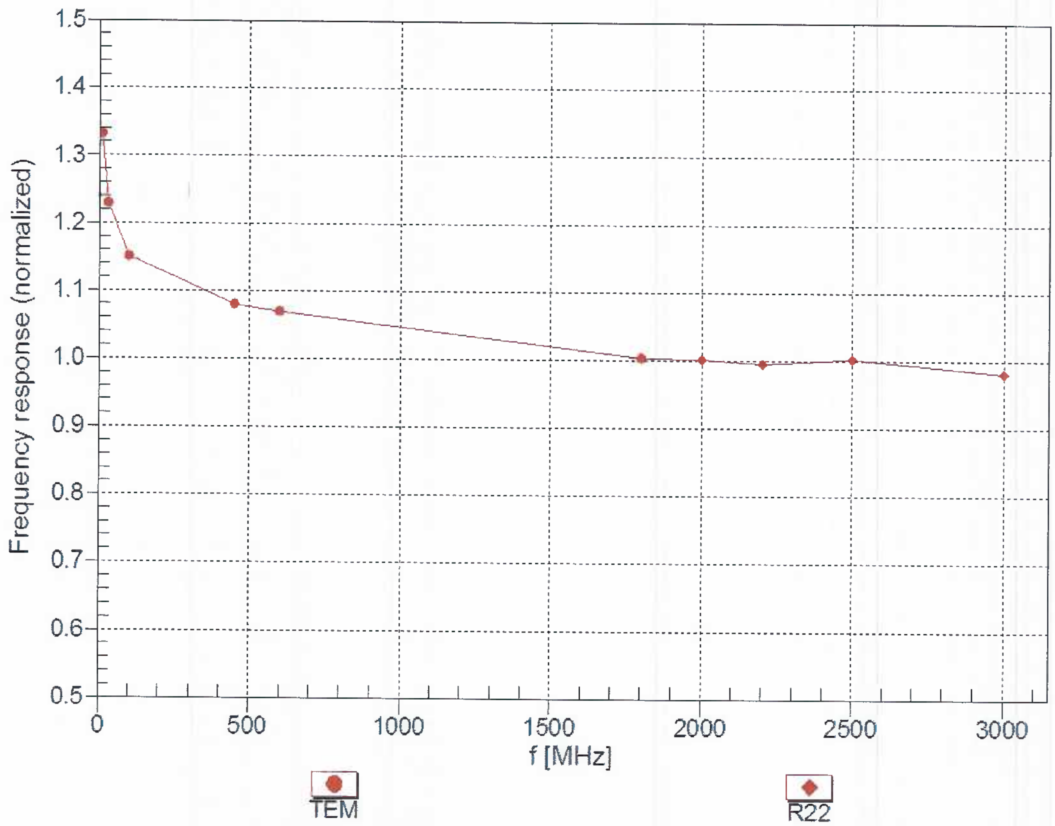
DASY/EASY - Parameters of Probe: EX3DV4 - SN:7531

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	5.40	5.40	5.40	0.20	2.50	± 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.

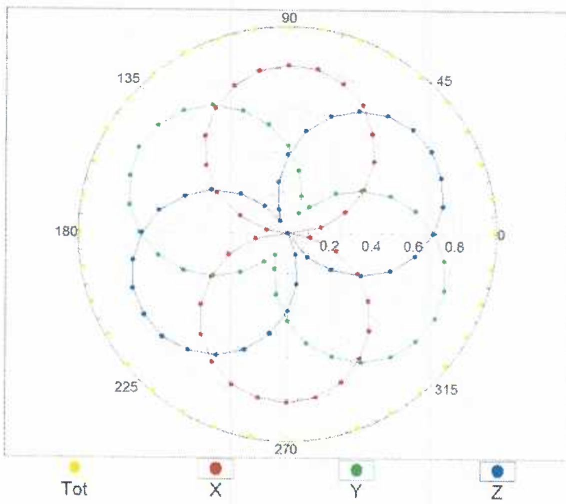
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



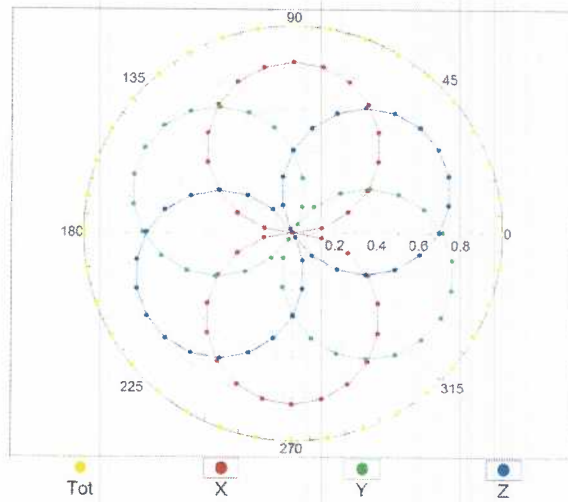
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

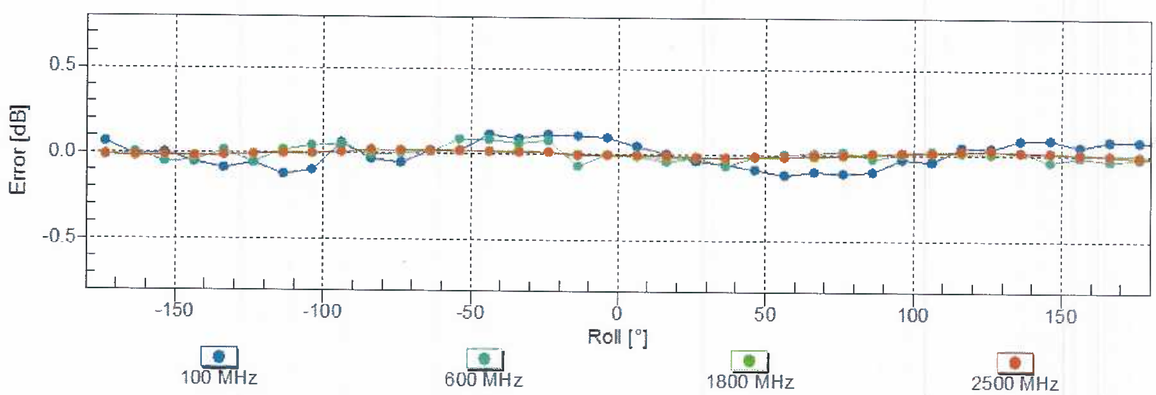
Receiving Pattern (ϕ), $\vartheta = 0°$

f=600 MHz,TEM



f=1800 MHz,R22

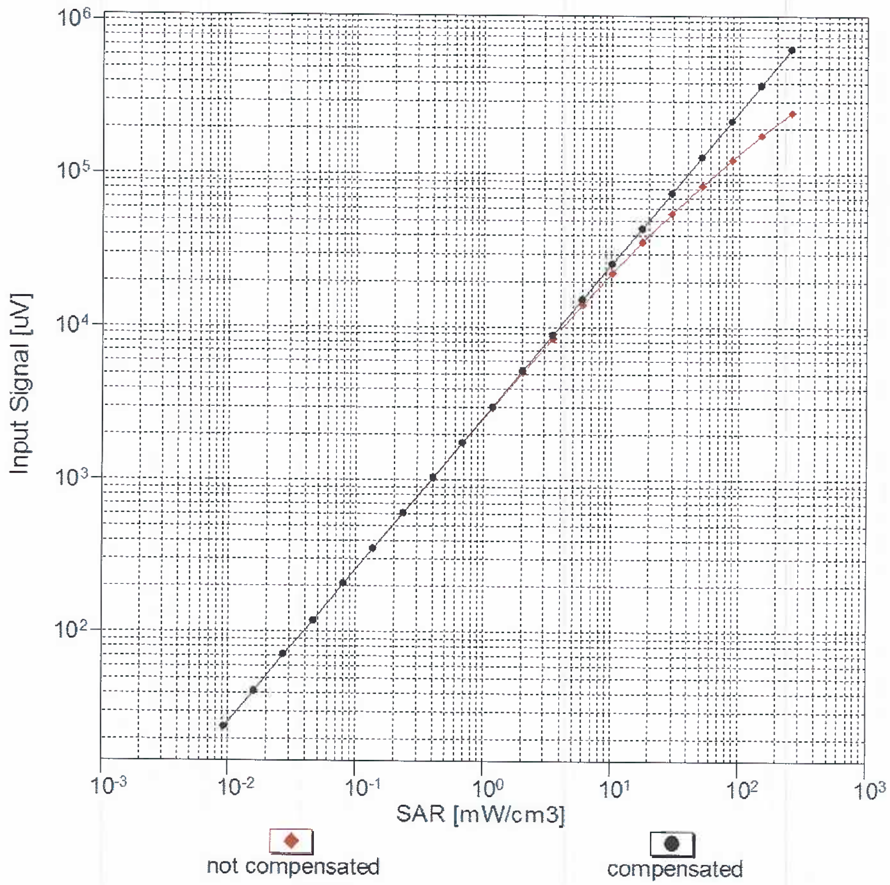


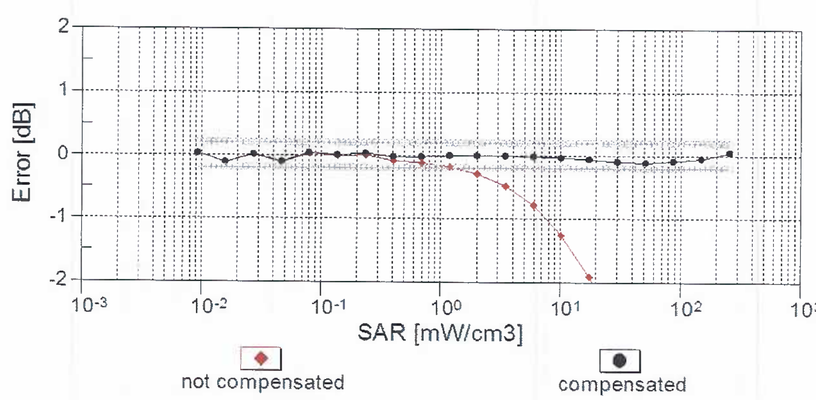


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)

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

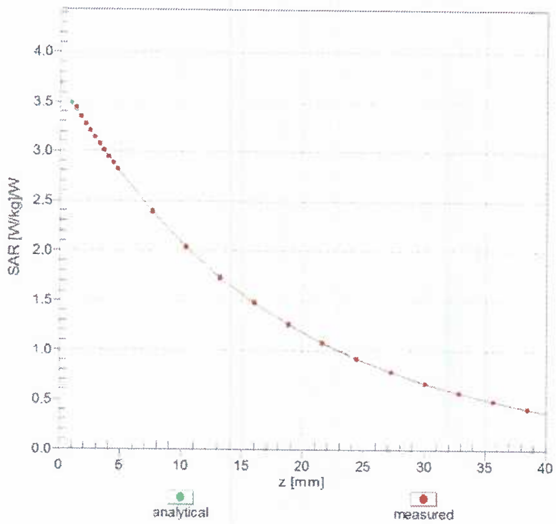




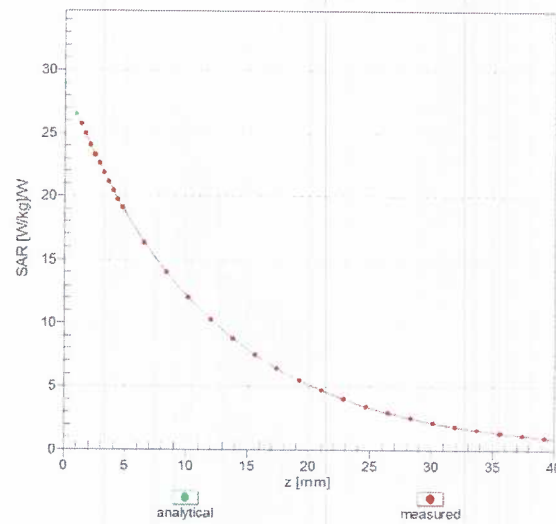
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 900 MHz,WGLS R9 (H_convF)

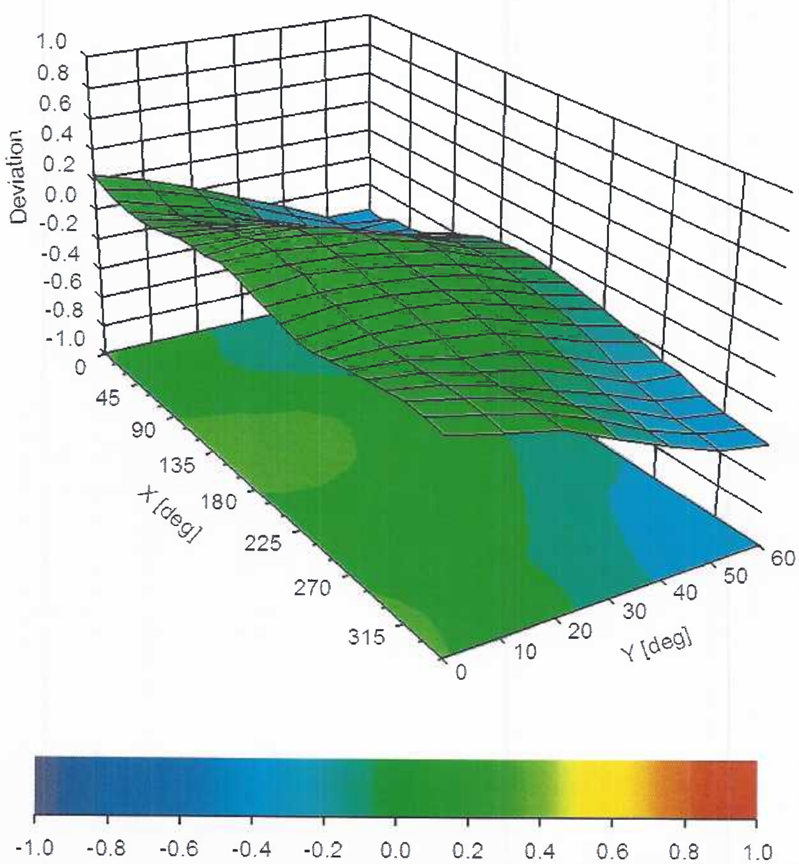


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

Appendix E – Dipole Calibration Data Sheets

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

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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: D750V3-1016_Jul18

CALIBRATION CERTIFICATE

Object	D750V3 - SN:1016
Calibration procedure(s)	QA CAL-05.v10 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	July 13, 2018

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 16, 2018

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

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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

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	V52.10.1
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	40.9 ± 6 %	0.89 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	2.07 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.23 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.38 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.3 ± 6 %	0.96 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.55 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.64 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	53.4 Ω + 0.0 jΩ
Return Loss	- 29.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.8 Ω - 2.6 jΩ
Return Loss	- 30.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.038 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
Manufactured on	March 22, 2010

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

D750V3 SN: 1016 - Head						
Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
7/13/2018	-29.6		53.4		0.0	
7/13/2019	-28.2	-4.7	54.9	1.5	-0.2	-0.2
7/13/2020	-30.1	1.7	52.8	-0.6	0.1	0.1

D750V3 SN: 1016 - Body						
Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
7/13/2018	-30.7		48.8		-2.6	
7/13/2019	-29.8	-2.9	49.2	0.4	-2.7	-0.1
7/13/2020	-31.1	1.1	47.6	-1.2	-2.5	0.1

DASY5 Validation Report for Head TSL

Date: 13.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1016

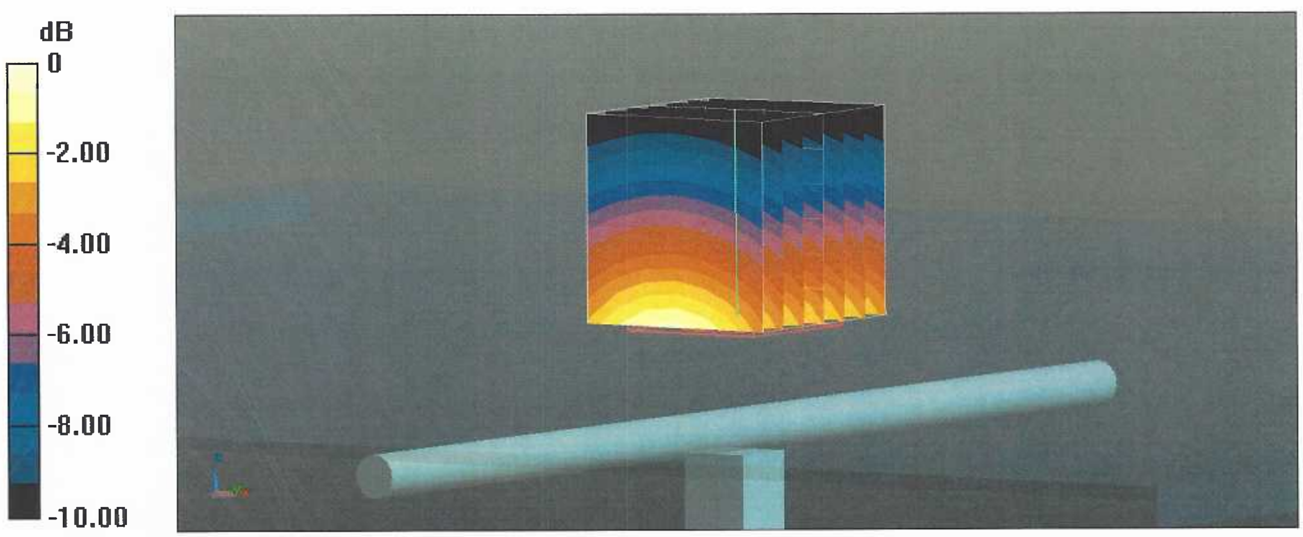
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.89 S/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.22, 10.22, 10.22) @ 750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

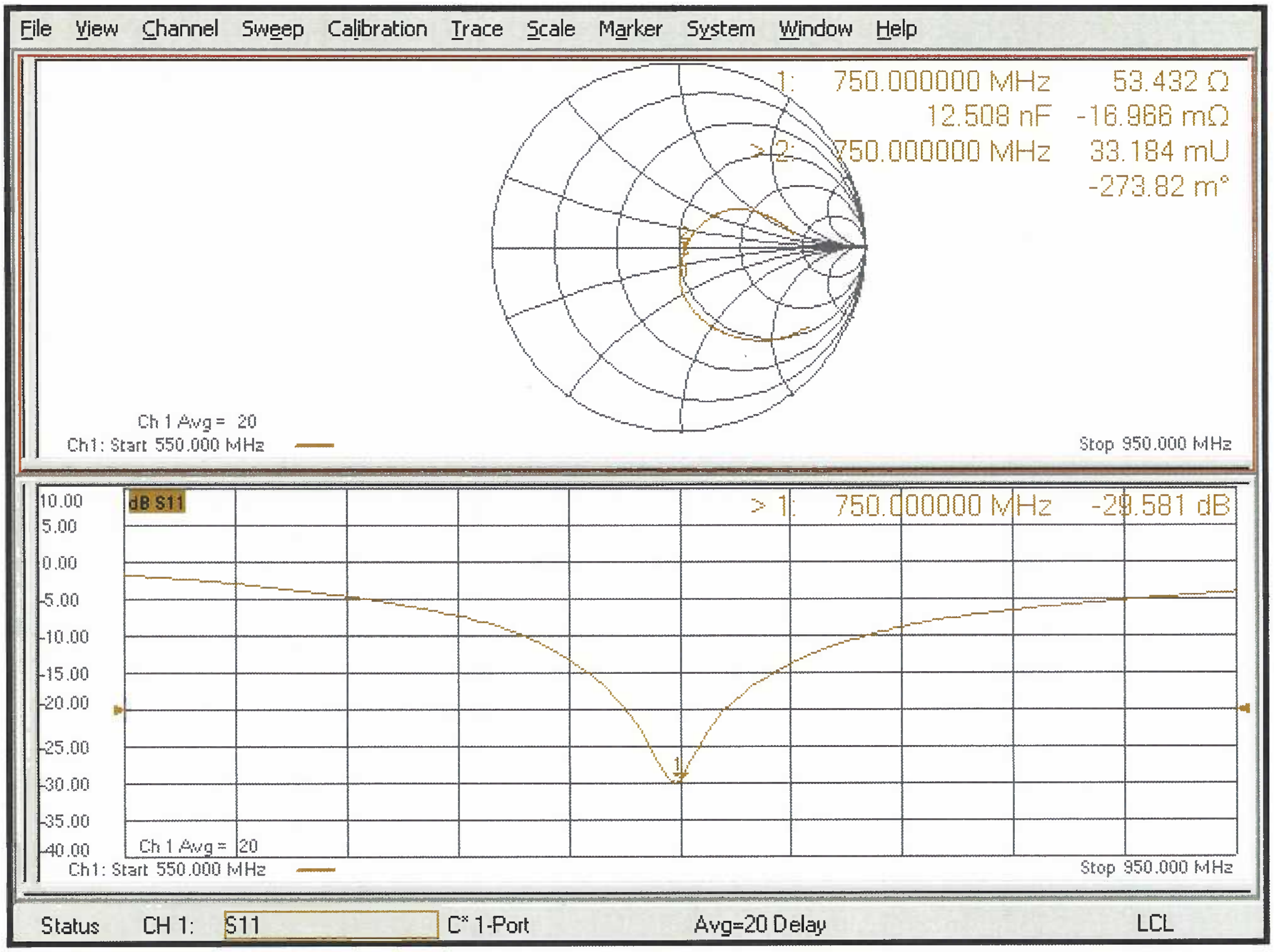
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.03 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.10 W/kg
SAR(1 g) = 2.07 W/kg; SAR(10 g) = 1.35 W/kg
Maximum value of SAR (measured) = 2.76 W/kg



0 dB = 2.76 W/kg = 4.41 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 13.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1016

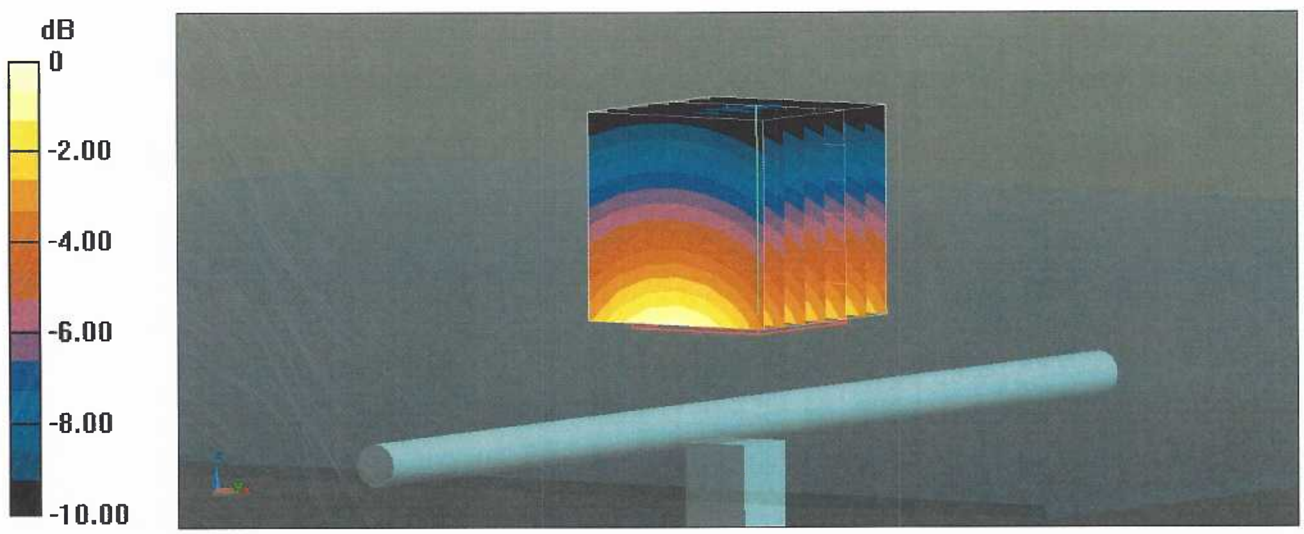
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.96 S/m; ε_r = 55.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.19, 10.19, 10.19) @ 750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

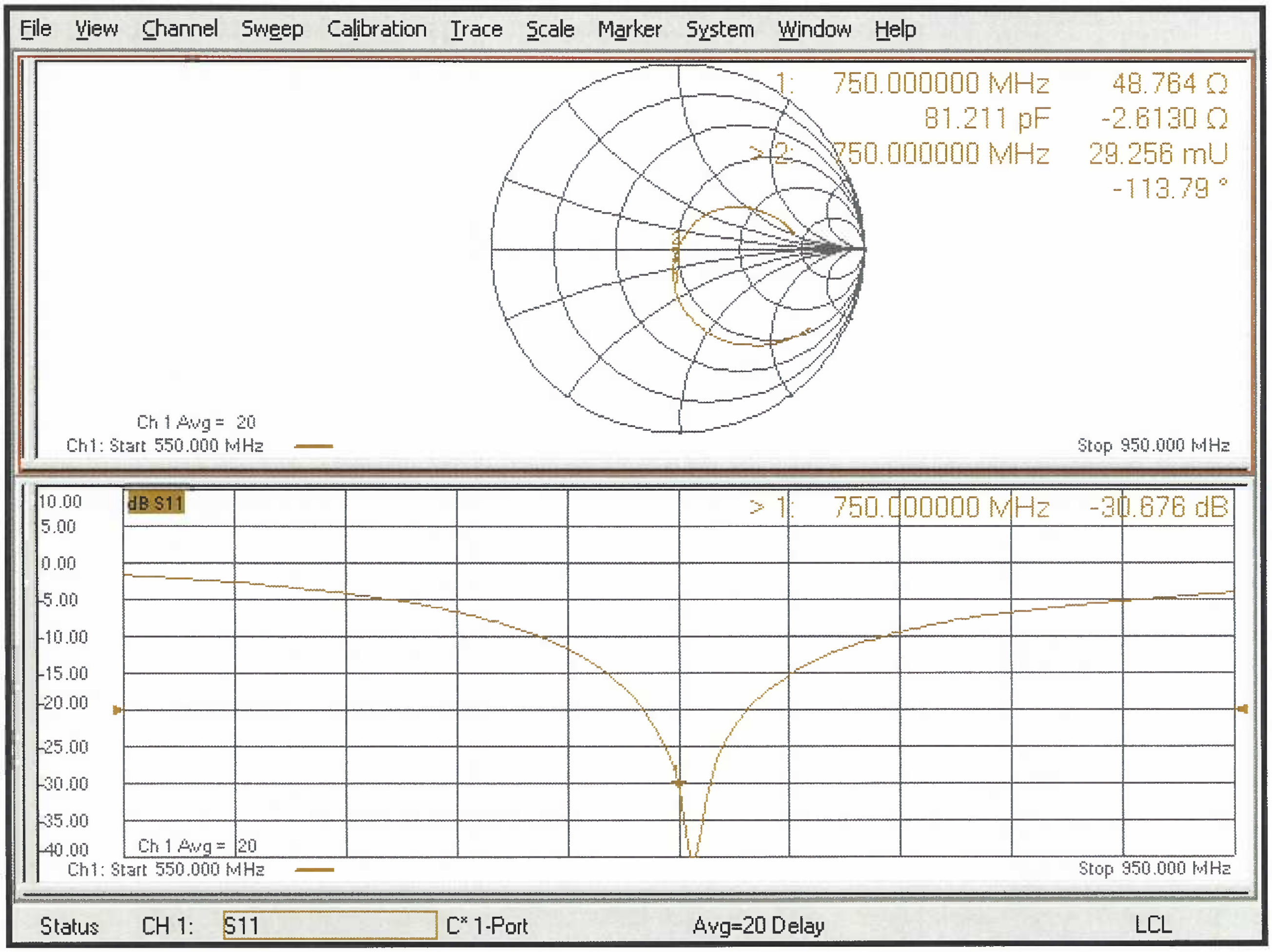
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.68 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.18 W/kg
SAR(1 g) = 2.14 W/kg; SAR(10 g) = 1.41 W/kg
Maximum value of SAR (measured) = 2.84 W/kg



0 dB = 2.84 W/kg = 4.53 dBW/kg

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
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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: D900V2-1d044_Jul18

CALIBRATION CERTIFICATE

Object	D900V2 - SN:1d044
Calibration procedure(s)	QA CAL-05.v10 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	July 13, 2018

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 16, 2018

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	V52.10.1
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	40.6 ± 6 %	0.95 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	2.69 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**10.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.72 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.94 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.0	1.05 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.0 ± 6 %	1.01 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.68 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**11.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.74 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**7.12 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	49.7 Ω - 7.0 jΩ
Return Loss	- 23.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.0 Ω - 8.1 jΩ
Return Loss	- 20.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.410 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
Manufactured on	September 26, 2006

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

D900V2 SN: 1d044 - Head						
Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
7/13/2018	-23.1		49.7		-7.0	
7/13/2019	-22.9	-0.9	50.2	0.5	-6.8	0.2
7/13/2020	-23.5	1.7	48.5	-1.2	-7.4	-0.4

D900V2 SN: 1d044 - Body						
Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
7/13/2018	-20.0		45.0		-8.1	
7/13/2019	-21.3	6.5	46.5	1.5	-7.8	0.3
7/13/2020	-21.6	8.0	45.8	0.8	-7.5	0.6

DASY5 Validation Report for Head TSL

Date: 13.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:1d044

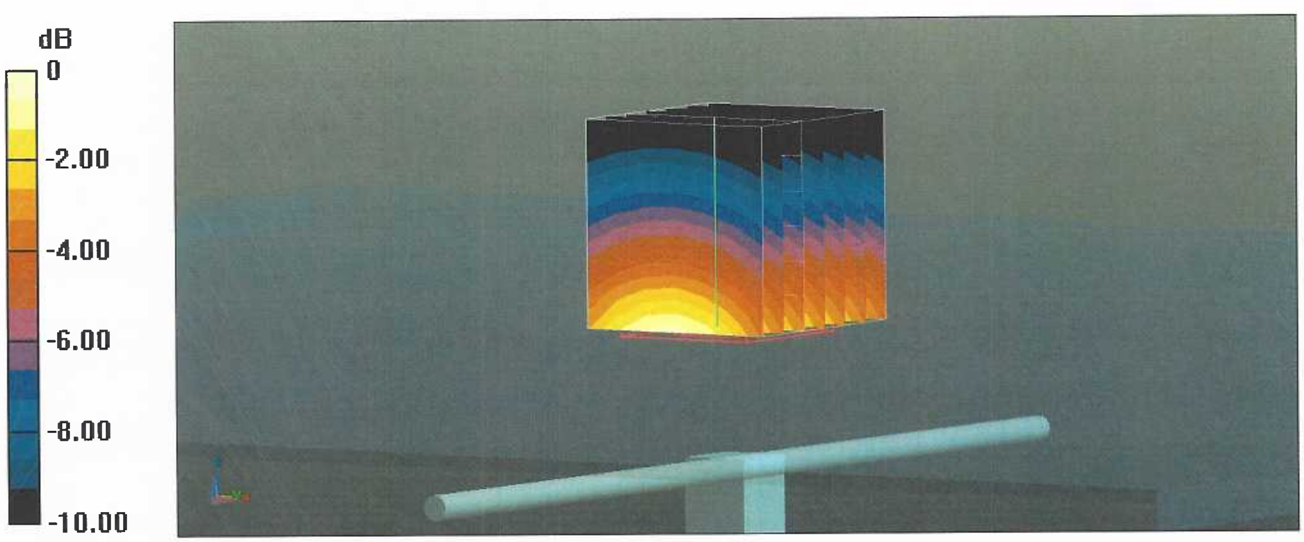
Communication System: UID 0 - CW; Frequency: 900 MHz
Medium parameters used: f = 900 MHz; σ = 0.95 S/m; ε_r = 40.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.71, 9.71, 9.71) @ 900 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

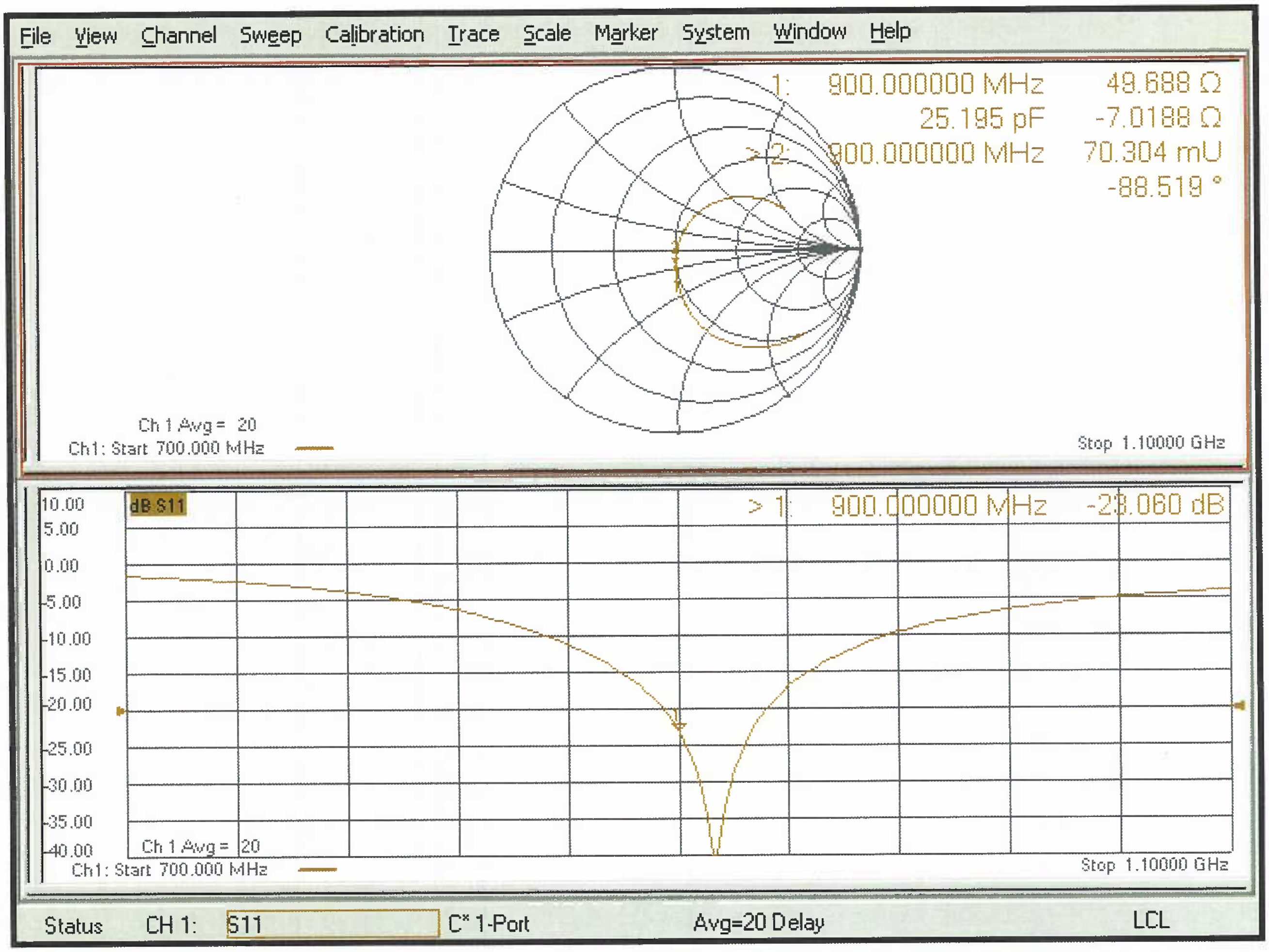
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 65.57 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 4.07 W/kg
SAR(1 g) = 2.69 W/kg; SAR(10 g) = 1.72 W/kg
Maximum value of SAR (measured) = 3.60 W/kg



0 dB = 3.60 W/kg = 5.56 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 13.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:1d044

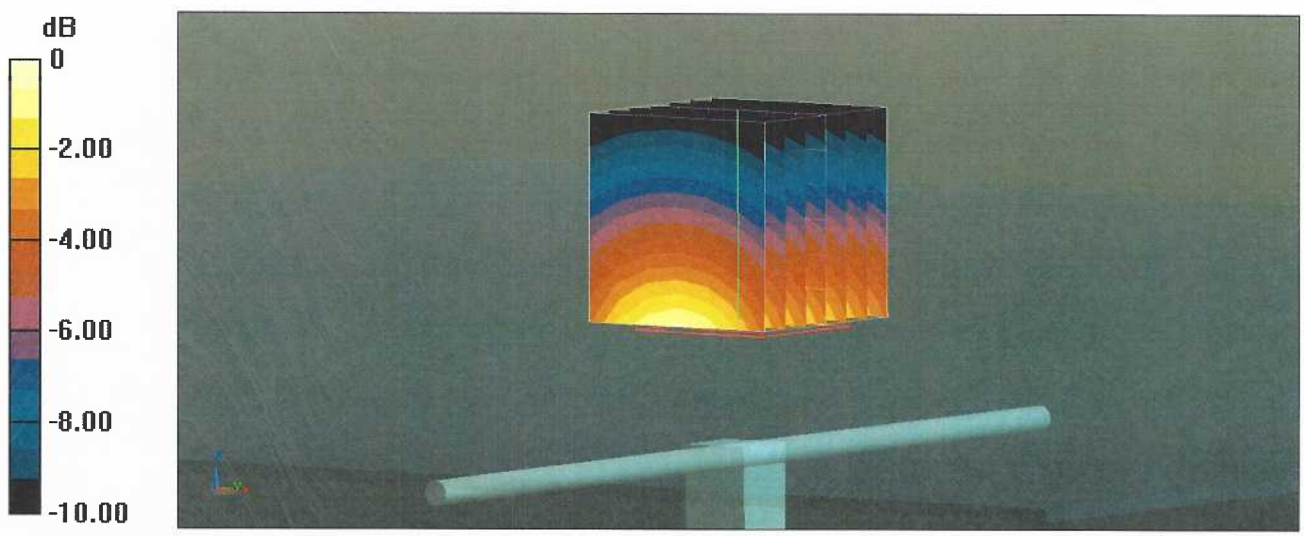
Communication System: UID 0 - CW; Frequency: 900 MHz
Medium parameters used: f = 900 MHz; σ = 1.01 S/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.83, 9.83, 9.83) @ 900 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

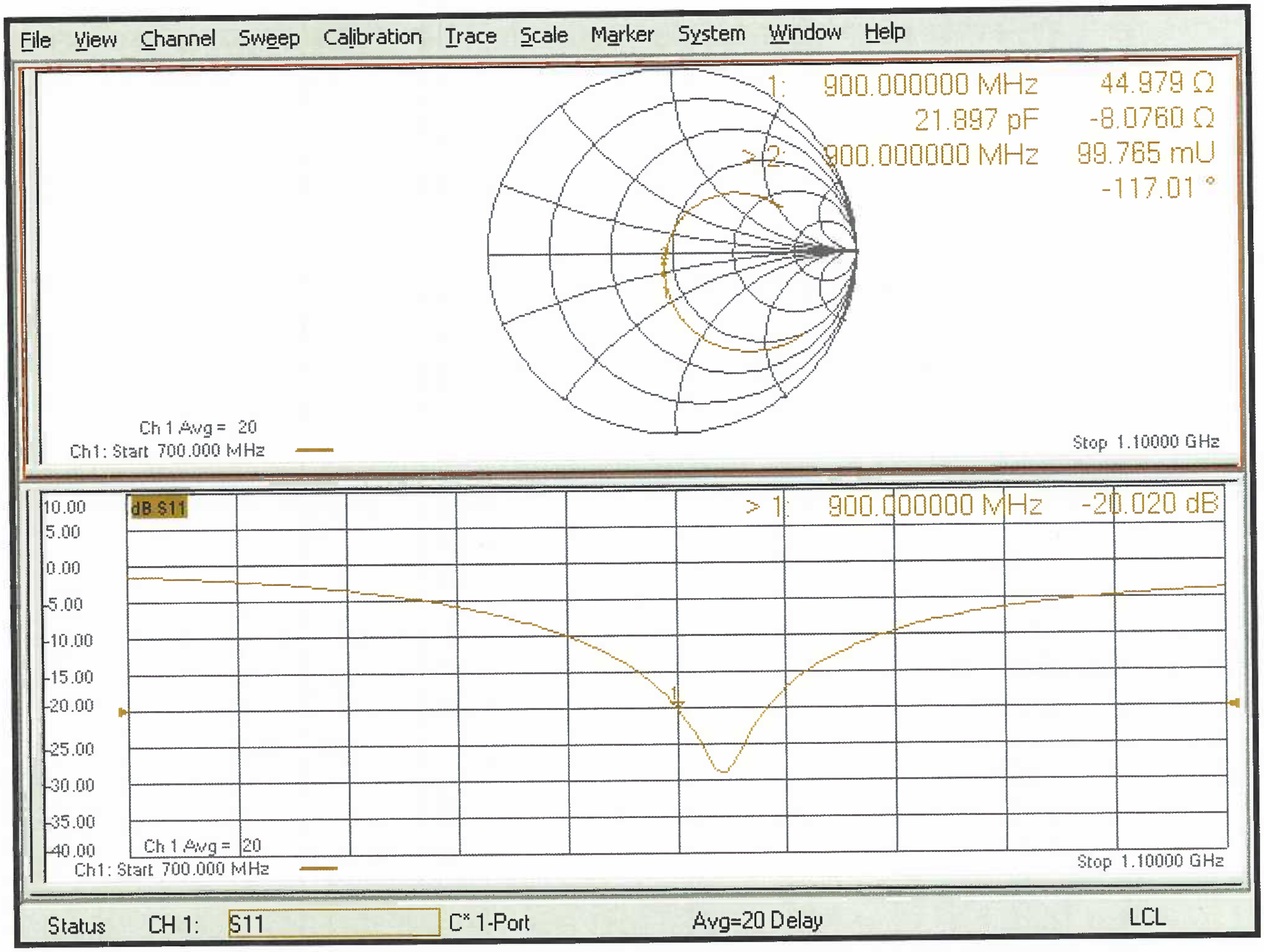
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 63.34 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.89 W/kg
SAR(1 g) = 2.68 W/kg; SAR(10 g) = 1.74 W/kg
Maximum value of SAR (measured) = 3.53 W/kg



0 dB = 3.53 W/kg = 5.48 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client **RF Exposure Lab**

Certificate No: **D1750V2-1018_Jul18**

CALIBRATION CERTIFICATE

Object: D1750V2 - SN:1018

Calibration procedure(s): QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: July 20, 2018

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 20, 2018

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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	V52.10.1
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	39.0 ± 6 %	1.34 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	8.95 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.73 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.0 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.7 ± 6 %	1.46 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.00 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**36.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.80 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**19.4 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 - 1.3 jΩ
Return Loss	- 36.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.2 Ω - 0.1 jΩ
Return Loss	- 25.9 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
Manufactured on	February 11, 2009

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

D1750V2 SN: 1018 - Head						
Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
7/20/2018	-36.8		49.4		-1.3	
7/13/2019	-37.2	1.1	48.9	-0.5	-1.6	-0.3
7/20/2020	-36.1	-1.9	48.4	-1.0	-1.4	-0.1
D1750V2 SN: 1018 - Body						
Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
7/20/2018	-25.9		45.2		-0.1	
7/13/2019	-26.5	2.3	45.8	0.6	-0.2	-0.1
7/20/2020	-26.1	0.8	44.9	-0.3	-0.1	0.0

DASY5 Validation Report for Head TSL

Date: 20.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1018

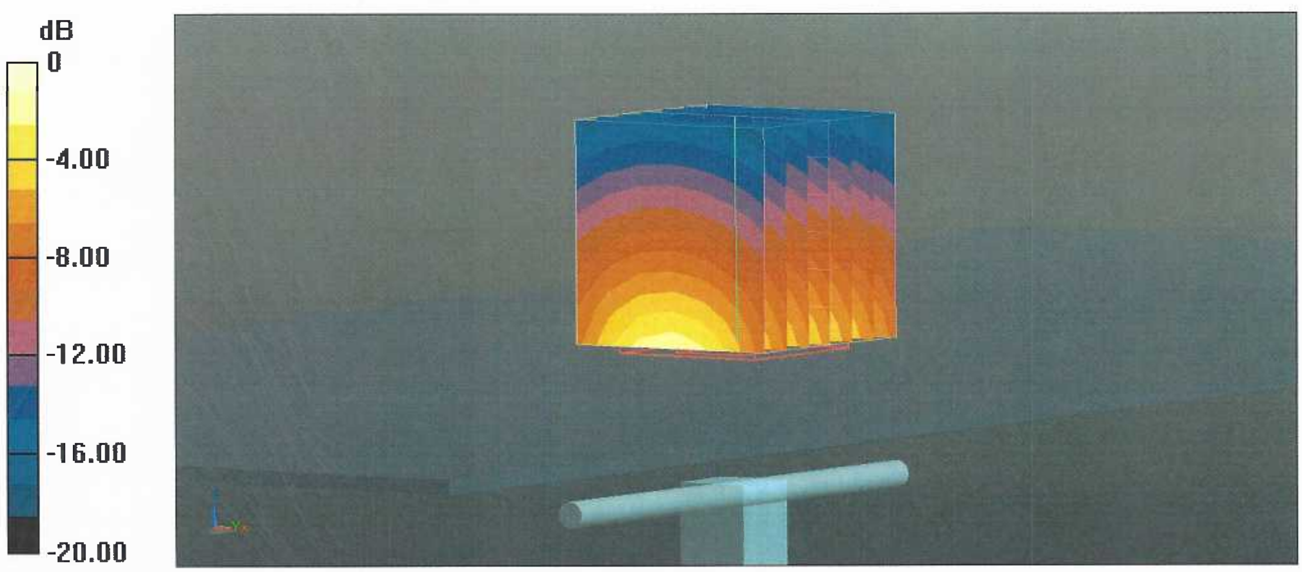
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.34 S/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.5, 8.5, 8.5) @ 1750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

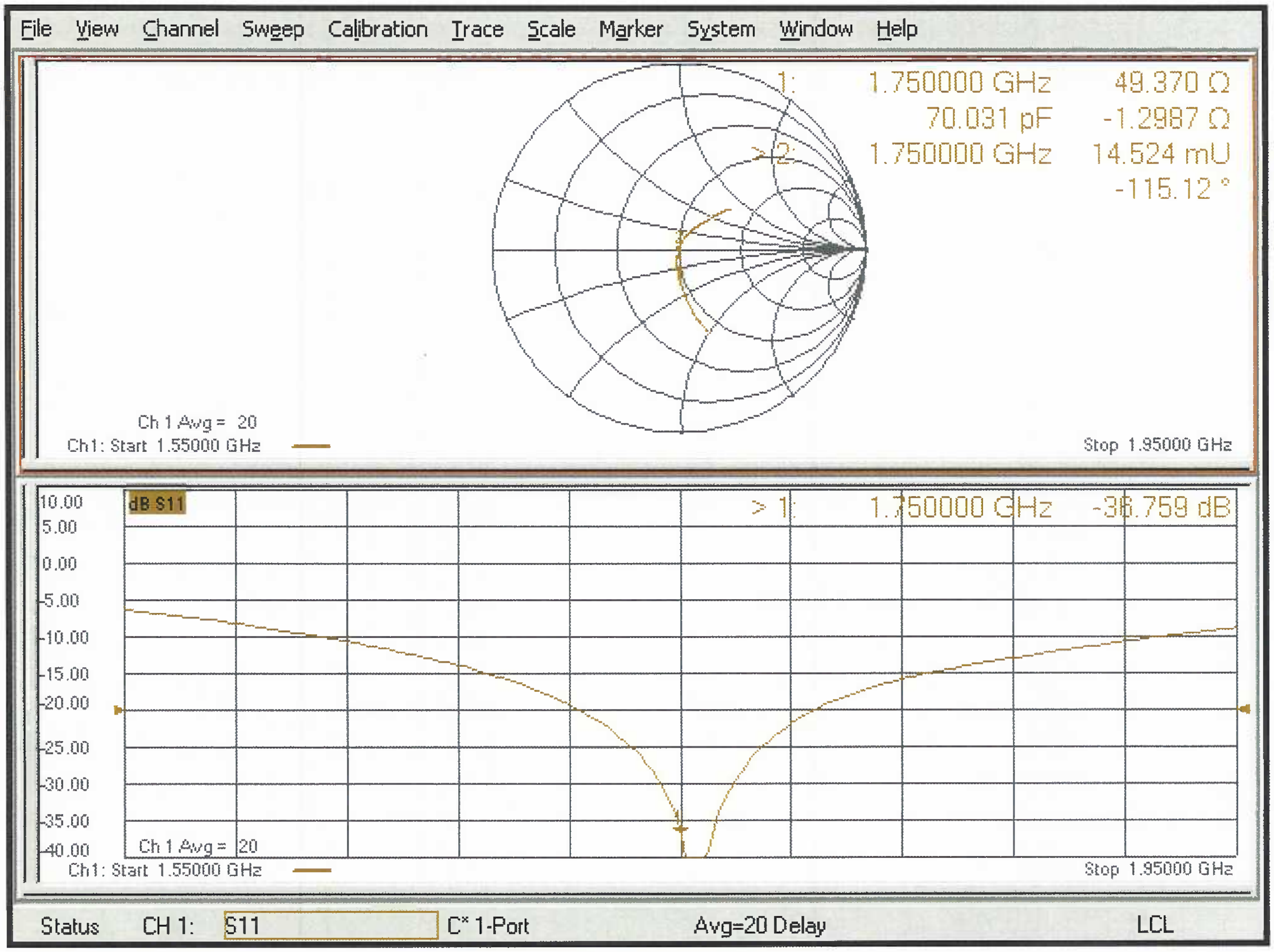
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 106.7 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 16.4 W/kg
SAR(1 g) = 8.95 W/kg; SAR(10 g) = 4.73 W/kg
Maximum value of SAR (measured) = 13.9 W/kg



0 dB = 13.9 W/kg = 11.43 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 20.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1018

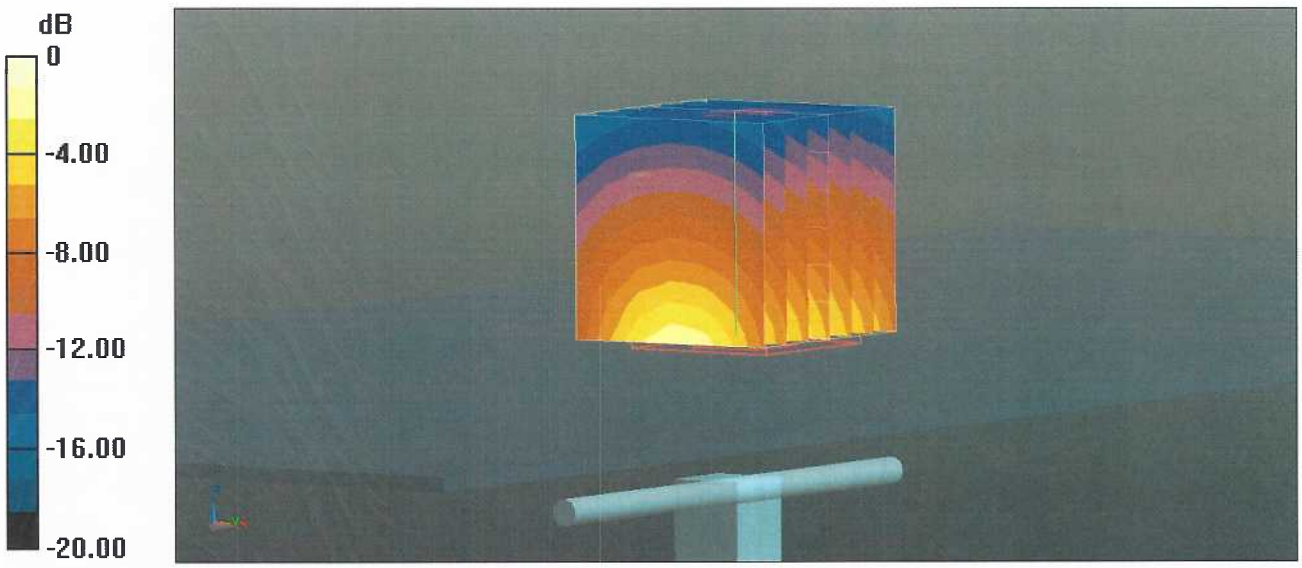
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.46 S/m; ε_r = 53.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.35, 8.35, 8.35) @ 1750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

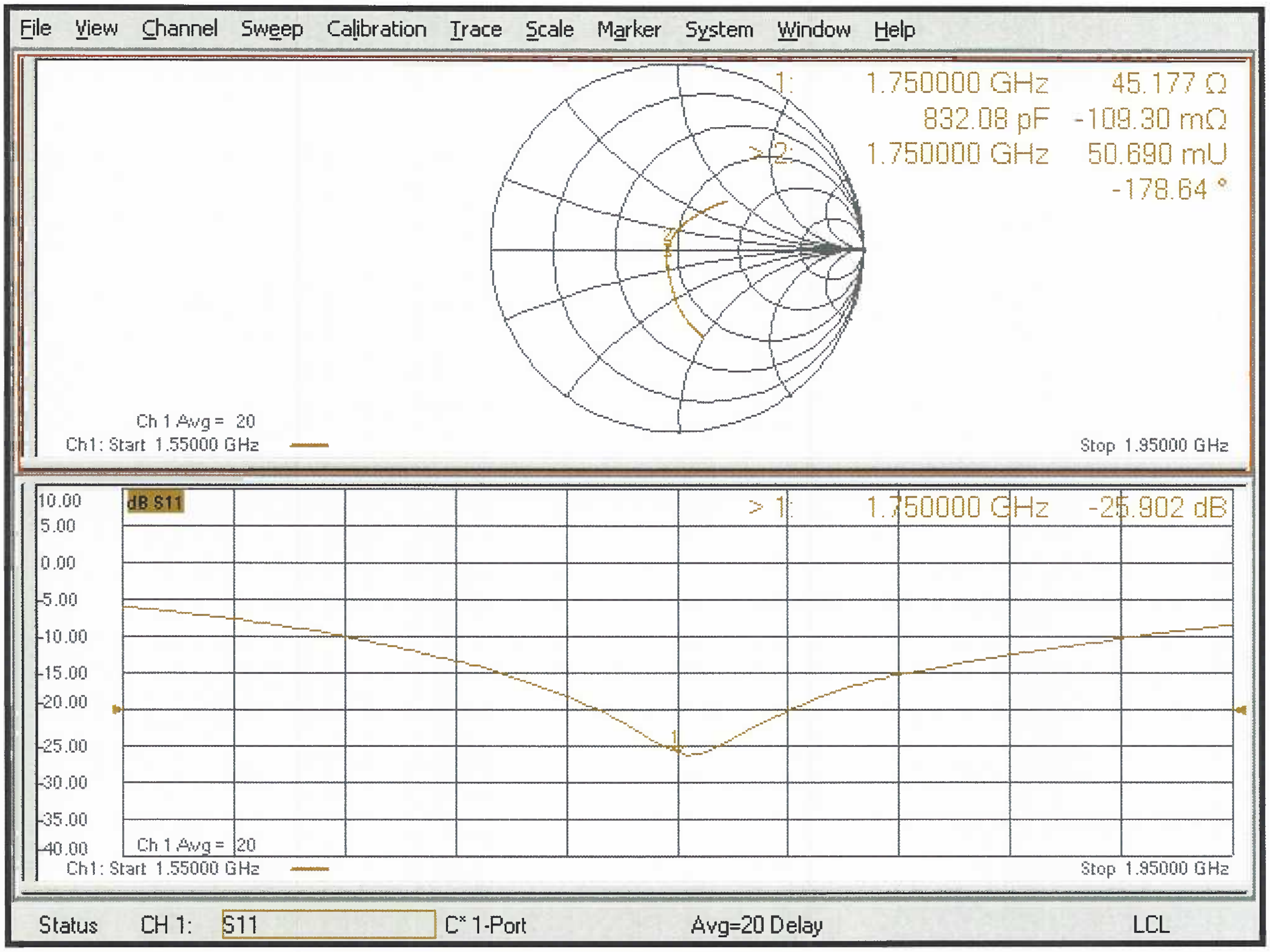
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.9 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 15.8 W/kg
SAR(1 g) = 9 W/kg; SAR(10 g) = 4.8 W/kg
Maximum value of SAR (measured) = 13.4 W/kg



0 dB = 13.4 W/kg = 11.27 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client **RF Exposure Lab**

Certificate No: D1900V2-5d116_Jul18

CALIBRATION CERTIFICATE

Object	D1900V2 - SN:5d116
Calibration procedure(s)	QA CAL-05.v10 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	July 13, 2018

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 16, 2018

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	V52.10.1
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	39.9 ± 6 %	1.34 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	9.90 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.27 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.4 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.3 ± 6 %	1.46 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.70 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.23 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.3 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	54.5 Ω + 5.0 jΩ
Return Loss	- 23.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.2 Ω + 8.3 jΩ
Return Loss	- 21.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.202 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
Manufactured on	August 21, 2009

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

D1900V2 SN: 5d116 - Head						
Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
7/13/2018	-23.9		54.5		5.0	
7/13/2019	-24.2	1.3	54.6	0.1	5.2	0.2
7/13/2020	-24.5	2.5	53.8	-0.7	4.8	-0.2

D1900V2 SN: 5d116 - Body						
Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
7/13/2018	-21.7		50.2		8.3	
7/13/2019	-22.3	2.8	49.6	-0.6	8.1	-0.2
7/13/2020	-21.9	0.9	51.4	1.2	8.6	0.3

DASY5 Validation Report for Head TSL

Date: 13.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d116

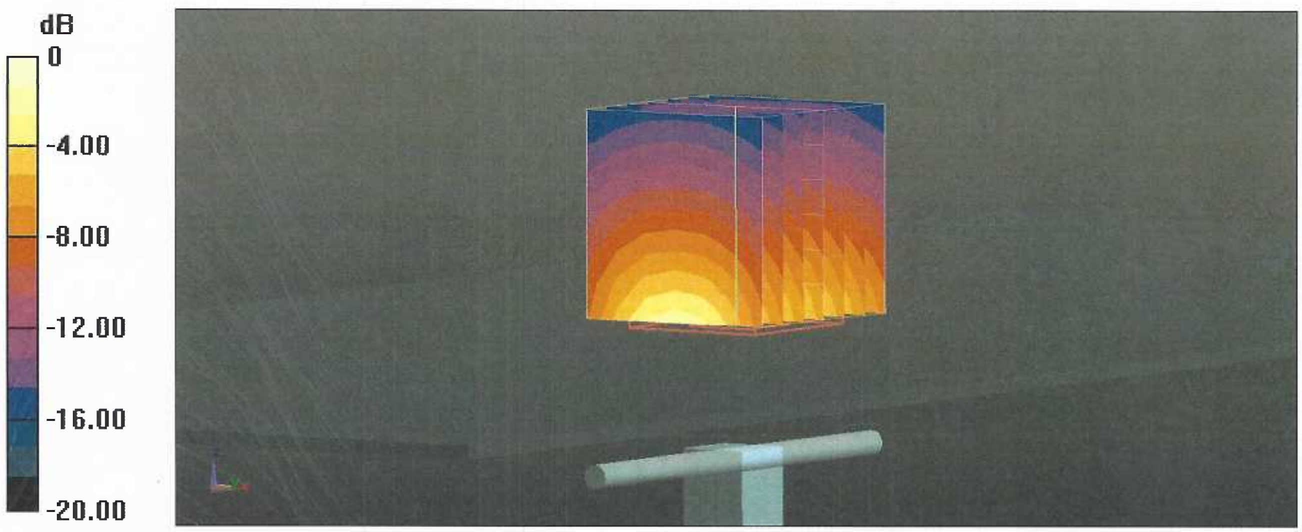
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.34 S/m; ε_r = 39.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.18, 8.18, 8.18) @ 1900 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

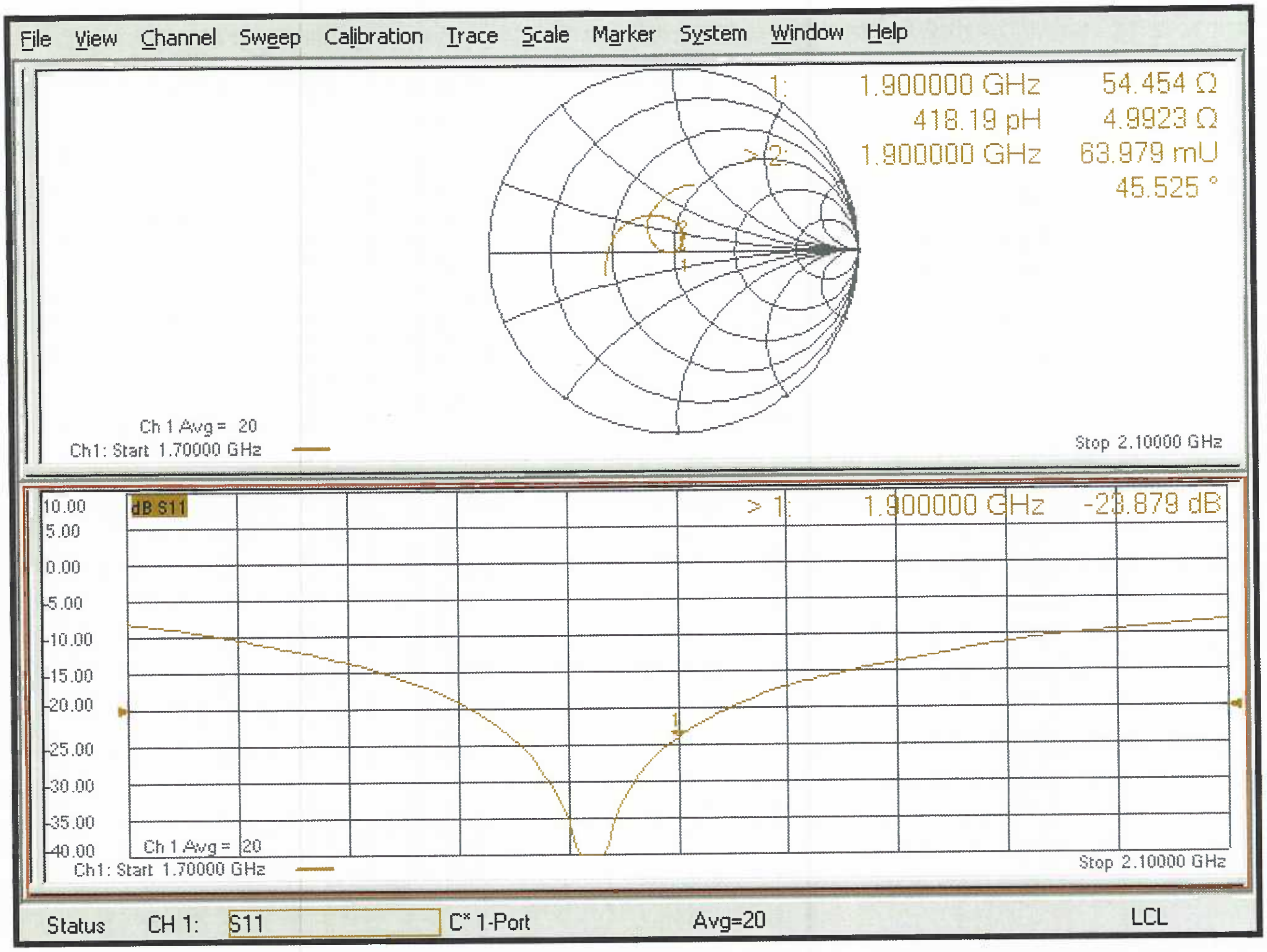
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 111.3 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 18.0 W/kg
SAR(1 g) = 9.9 W/kg; SAR(10 g) = 5.27 W/kg
Maximum value of SAR (measured) = 15.3 W/kg



0 dB = 15.3 W/kg = 11.85 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 13.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

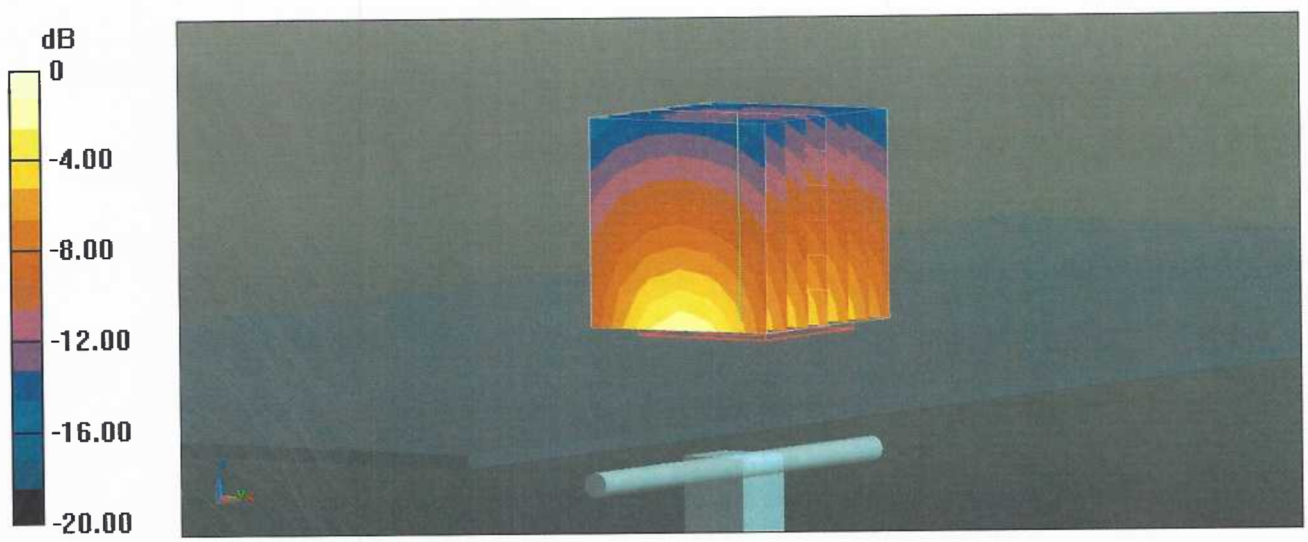
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d116

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.46 S/m; ε_r = 54.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

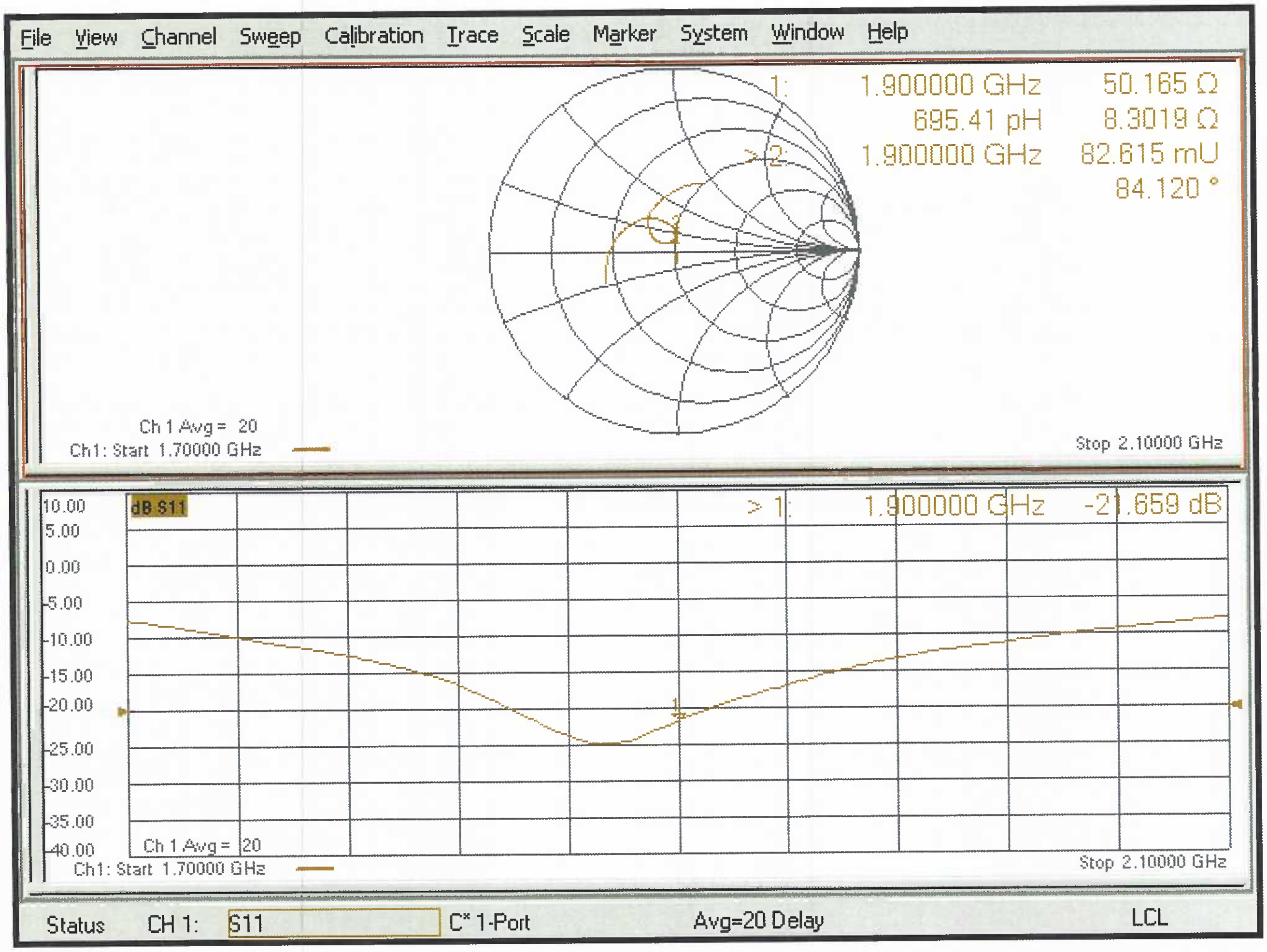
- Probe: EX3DV4 - SN7349; ConvF(8.15, 8.15, 8.15) @ 1900 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 104.5 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 16.8 W/kg
SAR(1 g) = 9.7 W/kg; SAR(10 g) = 5.23 W/kg
Maximum value of SAR (measured) = 14.4 W/kg



0 dB = 14.4 W/kg = 11.58 dBW/kg

Impedance Measurement Plot for Body TSL



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: D2450V2-829_Jul18

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:829
Calibration procedure(s)	QA CAL-05.v10 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	July 12, 2018

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 16, 2018

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	V52.10.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.8 ± 6 %	1.85 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	13.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**51.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.3 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.9 ± 6 %	2.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**51.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.06 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.0 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	52.9 Ω + 3.3 jΩ
Return Loss	- 27.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.9 Ω + 5.9 jΩ
Return Loss	- 24.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.156 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 11, 2008

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

D2450V2 SN: 829 - Head

Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
7/12/2018	-27.4		52.9		3.3	
7/13/2019	-27.9	1.8	53.4	0.5	3.7	0.4
7/13/2020	-26.9	-1.8	51.4	-1.5	3.0	-0.3

D2450V2 SN: 829 - Body

Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
7/12/2018	-24.5		50.9		5.9	
7/13/2019	-25.3	3.3	51.2	0.3	5.7	-0.2
7/13/2020	-24.1	-1.6	49.5	-1.4	5.8	-0.1

DASY5 Validation Report for Head TSL

Date: 12.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:829

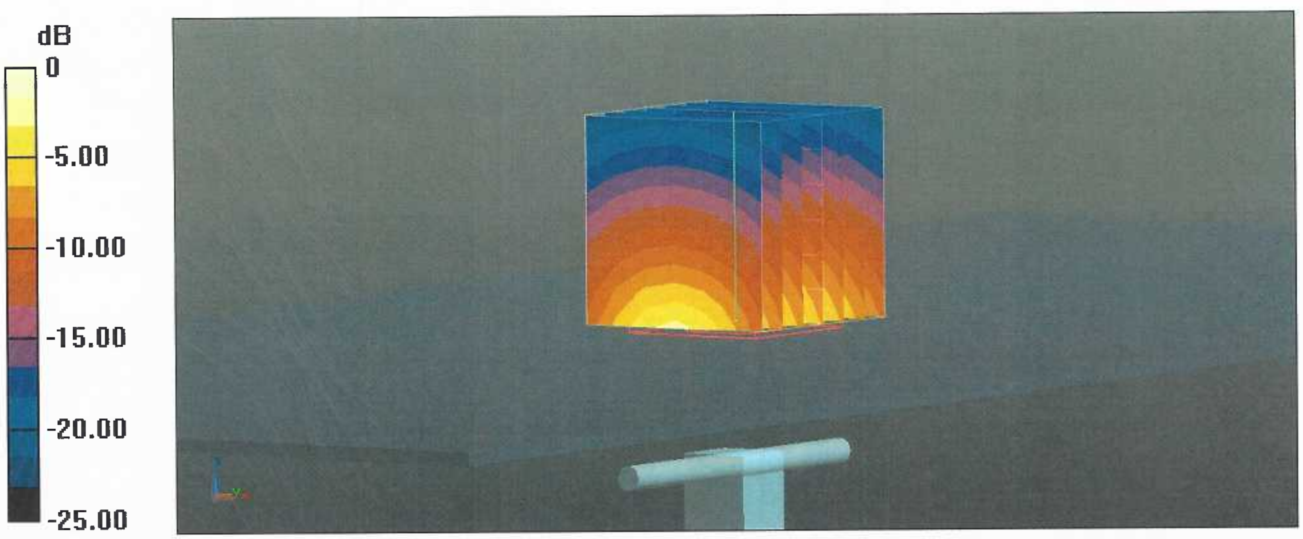
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.85 S/m; ε_r = 37.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.88, 7.88, 7.88) @ 2450 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

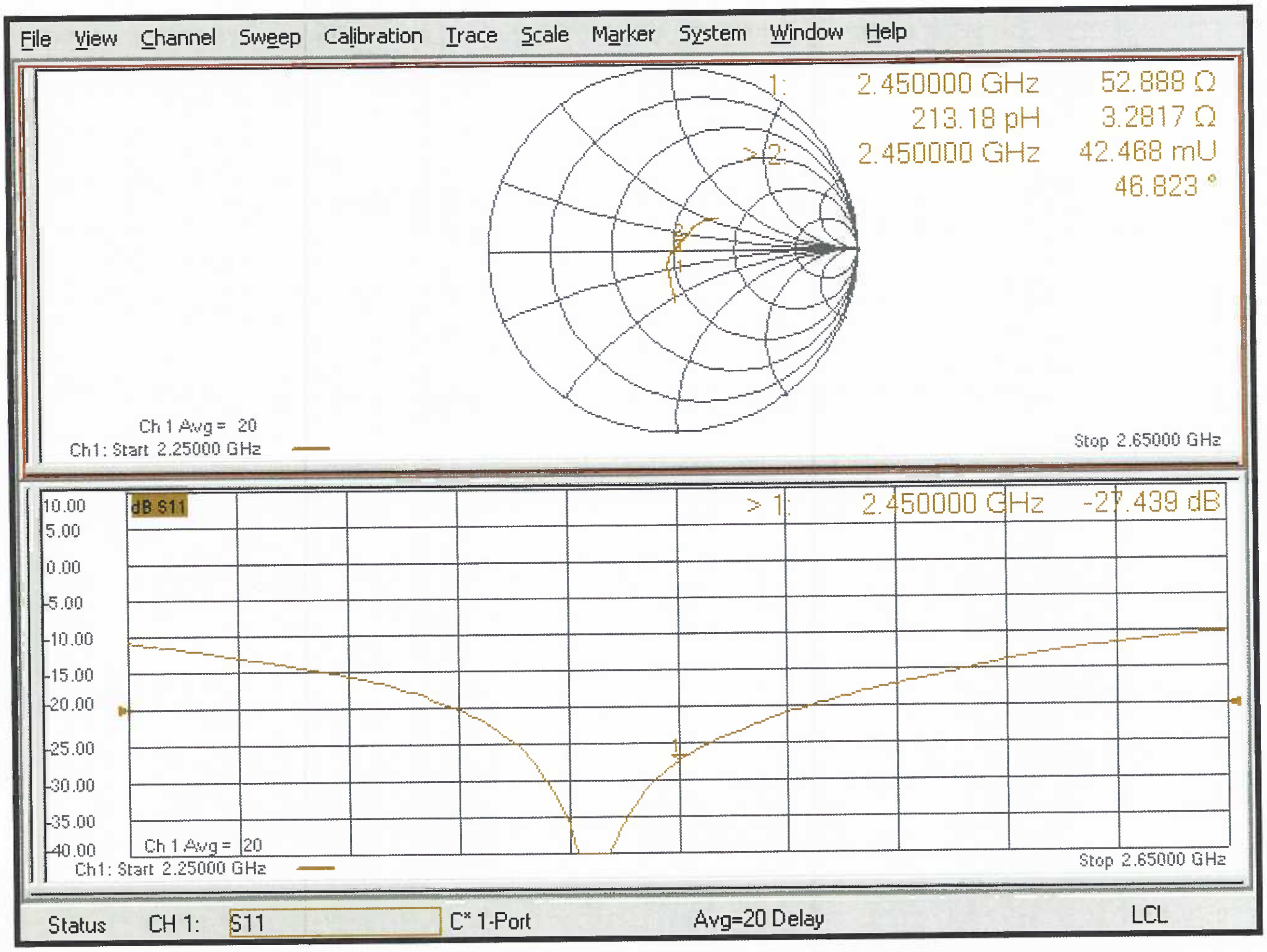
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 116.7 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 26.4 W/kg
SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.15 W/kg
Maximum value of SAR (measured) = 21.9 W/kg



0 dB = 21.9 W/kg = 13.40 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 12.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

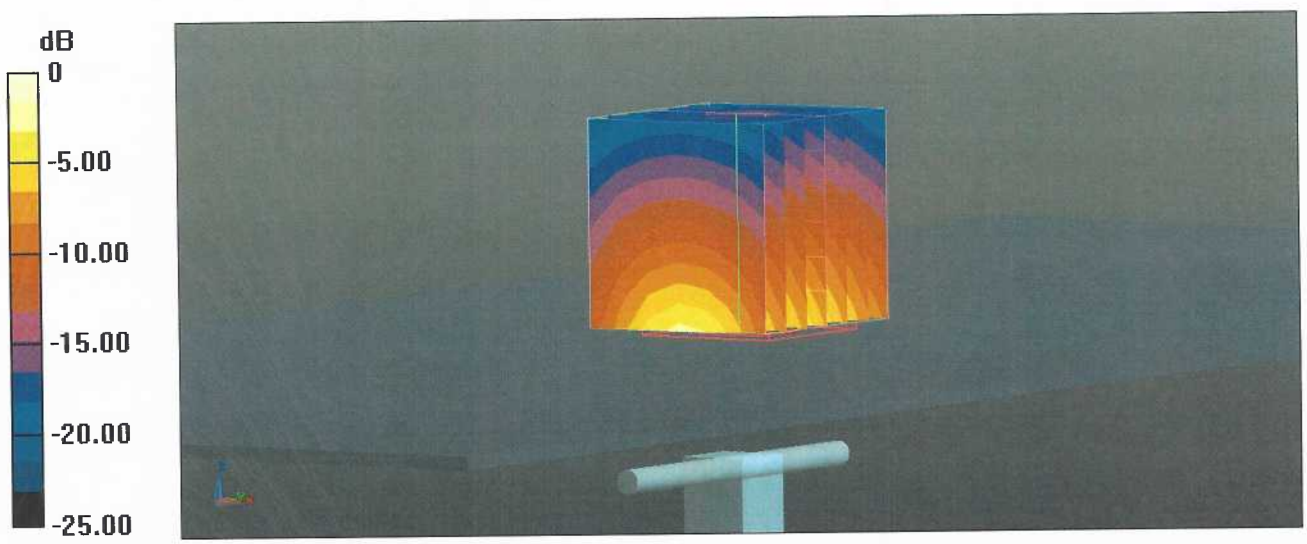
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:829

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.02 S/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

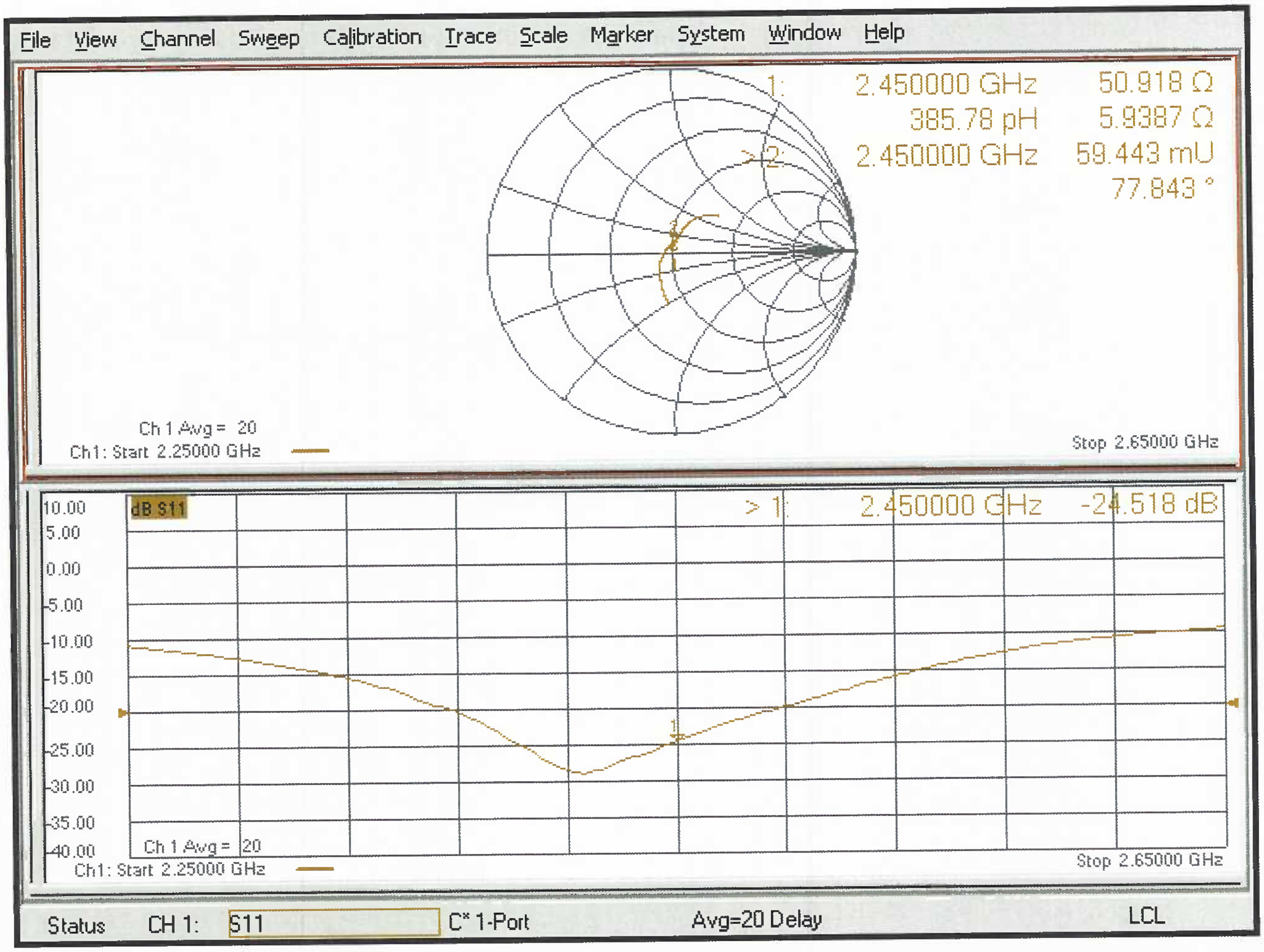
- Probe: EX3DV4 - SN7349; ConvF(8.01, 8.01, 8.01) @ 2450 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 107.9 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 25.6 W/kg
SAR(1 g) = 13 W/kg; SAR(10 g) = 6.06 W/kg
Maximum value of SAR (measured) = 21.1 W/kg



0 dB = 21.1 W/kg = 13.24 dBW/kg

Impedance Measurement Plot for Body TSL



Appendix F – Phantom Calibration Data Sheets

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Certificate of Conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 C
Series No	TP-1150 and higher
Manufacturer	SPEAG Zeughausstrasse 43 CH-8004 Zürich Switzerland

Tests
The series production process used allows the limitation to test of first articles.
Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series items (called samples) or are tested at each item.

Test	Requirement	Details	Units tested
Dimensions	Compliant with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness of shell	Compliant with the requirements according to the standards	2mm +/- 0.2mm in flat and specific areas of head section	First article, Samples, TP-1314 ff.
Material thickness at ERP	Compliant with the requirements according to the standards	6mm +/- 0.2mm at ERP	First article, All items
Material parameters	Dielectric parameters for required frequencies	300 MHz – 6 GHz: Relative permittivity < 5, Loss tangent < 0.05	Material samples
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. Observe technical Note for material compatibility.	DEGMBE based simulating liquids	Pre-series, First article, Material samples
Sagging	Compliant with the requirements according to the standards. Sagging of the flat section when filled with tissue simulating liquid.	< 1% typical < 0.8% if filled with 155mm of HSL900 and without DUT below	Prototypes, Sample testing

Standards
[1] CENELEC EN 50361
[2] IEEE Std 1528-2003
[3] IEC 62209 Part I
[4] FCC OET Bulletin 65, Supplement C, Edition 01-01
(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of the other documents.

Conformity
Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standards [1] to [4].

Date 07.07.2005

Signature / Stamp

s p e a g
Schmid & Partner Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

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**

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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 Validation		
									Sens-itivity	Probe Linearity	Probe Isotropy	Modulation Type	Duty Factor	PAR
2	750	05/03/2021	7531	EX3DV4	750	Head	0.93	41.19	Pass	Pass	Pass	QPSK	Pass	Pass
2	900	05/03/2021	7531	EX3DV4	900	Head	0.99	40.29	Pass	Pass	Pass	QPSK	Pass	Pass
2	1750	05/03/2021	7531	EX3DV4	1750	Head	1.39	39.52	Pass	Pass	Pass	QPSK	Pass	Pass
2	1900	05/04/2021	7531	EX3DV4	1900	Head	1.42	39.11	Pass	Pass	Pass	QPSK	Pass	Pass
2	2450	04/29/2021	7531	EX3DV4	2450	Head	1.83	38.64	Pass	Pass	Pass	DSSS/OFDM	Pass	Pass