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CERTIFICATE OF COMPLIANCE
SAR EVALUATION

Xplore Technologies
14000 Summit Drive, Suite 900
Austin, TX 78728

Dates of Test: August 15-23, November 21, 2016
Test Report Number: SAR.20160809
Revision C

FCC ID:	Q2GEM7455 & PD98260NG
IC Certificate:	4596A-EM7455 & 1000M-8260NG
Model(s):	iX125R1
Part Number:	003-01-0235
Contains Module:	Sierra Wireless Model MC7455, Intel Corp. Model 8260NGW
Test Sample:	Engineering Unit Same as Production
Serial Number:	65JKG00077
Equipment Type:	Wireless Ruggedized Tablet
Classification:	Portable Transmitter Next to Body
TX Frequency Range:	699 – 716 MHz, 777 – 787 MHz, 814 – 849 MHz, 1710 – 1755 MHz, 1850 – 1915 MHz, 2305 – 2315 MHz, 2496 – 2690 MHz, 2412 – 2462 MHz, 5180 – 5320 MHz, 5500 – 5700 MHz, 5745 – 5825 MHz
Frequency Tolerance:	± 2.5 ppm
Maximum RF Output:	700 MHz (LTE) – 24.00 dBm, 782 MHz (LTE) – 24.00 dBm, 835 MHz (UMTS) – 24.00 dBm, 835 MHz (LTE) – 24.00 dBm, 1750 MHz (UMTS) – 24.00 dBm; 1750 MHz (LTE) – 24.00 dBm, 1900 MHz (UMTS) – 24.00 dBm, 1900 MHz (LTE) – 24.00 dBm, 2300 MHz (LTE) – 23.00 dBm, 2600 MHz (LTE) – 23.00 dBm, 2450 MHz (b) – 17.50 dB, 2450 MHz (g) – 17.50 dB, 2450 MHz (n20) – 17.50 dB, 2450 MHz (n40) – 17.50 dB, 5250 MHz (a) – 16.00 dB, 5250 MHz (n20) – 16.00 dB, 5250 MHz (n40) – 16.00 dB, 5250 MHz (ac) – 13.50 dB, 5600 MHz (a) – 16.00 dB, 5600 MHz (n20) – 16.00 dB, 5600 MHz (n40) – 16.00 dB, 5600 MHz (ac) – 15.00 dB, 5800 MHz (a) – 16.00 dB, 5800 MHz (n20) – 16.00 dB, 5800 MHz (n40) – 16.00 dB, 5800 MHz (ac) – 15.00 dB Conducted
Signal Modulation:	DSSS, OFDM, WCDMA, QPSK, 16QAM
Antenna Type:	Internal
Application Type:	Certification
FCC Rule Parts:	Part 2, 15C, 15E, 22, 24
KDB Test Methodology:	KDB 447498 D01 v06, KDB248227 v02r02, KDB 616217 D04 v01r02KDB 941225 D01 v03r01, KDB 941225 D05 v02r01
Industry Canada:	RSS-102 Issue 5, Safety Code 6
Maximum SAR Value:	1.41 W/kg Reported
Max. Simultaneous:	0.04 Separation Ratio
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 is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).

Jay M. Moulton
Vice President

ACCREDITED
Testing Cert. # 2387.01

Table of Contents

1. Introduction

This measurement report shows compliance of the Xplore Technologies Model iX125R1 FCC ID: Q2GEM7455 & PD98260NG with FCC Part 2, 1093, ET Docket 93-62 Rules for mobile and portable devices and IC Certificate: 4596A-EM7455 & 1000M-8260NG 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 Xplore Technologies Model iX125R1 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 – 2013 Recommended Practice [4], and Industry Canada Safety Code 6 Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3kHz to 300 GHz were employed.

The following table indicates all the wireless technologies operating in the iX125R1 Wireless Ruggedized Tablet. The table also shows the tolerance for the power level for each mode (if applicable).

Band	Technology	Class	Setpoint Nominal Power dBm	Tolerance dBm	Lower Tolerance dBm	Upper Tolerance dBm
Band 25 – 1900 MHz	LTE – FDD	3	23	+1.0/-1.5	21.5	24.0
Band 2 – 1900 MHz	LTE – FDD	3	23	+1.0/-1.5	21.5	24.0
Band 12 – 700 MHz	LTE – FDD	3	23	+1.0/-1.5	21.5	24.0
Band 13 – 782 MHz	LTE – FDD	3	23	+1.0/-1.5	21.5	24.0
Band 5 – 850 MHz	LTE – FDD	3	23	+1.0/-1.5	21.5	24.0
Band 4 – 1750 MHz	LTE – FDD	3	23	+1.0/-1.5	21.5	24.0
Band 7 – 2600 MHz	LTE – FDD	3	22	+1.0/-1.5	20.5	23.0
Band 26 – 850 MHz	LTE – FDD	3	23	+1.0/-1.5	21.5	24.0
Band 30 – 2300 MHz	LTE – FDD	3	22	+1.0/-1.5	20.5	23.0
Band 41 – 2600 MHz	LTE – TDD	3	22	+1.0/-1.5	20.5	23.0
Band 5 – 850 MHz	UMTS	3	23	+1.0/-1.0	22.0	24.0
Band 4 – 1750 MHz	UMTS	3	23	+1.0/-1.0	22.0	24.0
Band 2 – 1900 MHz	UMTS	3	23	+1.0/-1.0	22.0	24.0
WLAN – 2.4 GHz	802.11b	N/A	16	±1.5	14.5	17.5
WLAN – 2.4 GHz	802.11g/n(Ch. 6)	N/A	16	±1.5	14.5	17.5
WLAN – 5 GHz Band I, II, III, IV	802.11a	N/A	14.5	±1.5	13.0	16.0

Note: The WiFi module is pre-approved for installation in the tablet based on the Intel Corp. modular grant. No SAR testing was conducted in the report.

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

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

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.

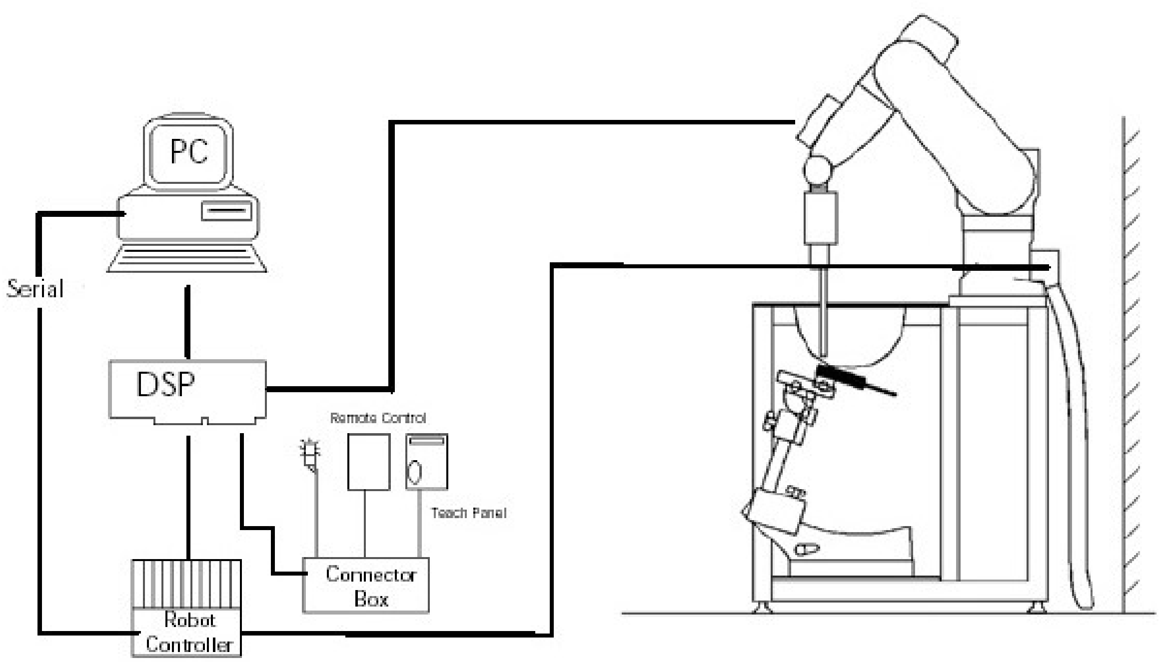


Figure 2.1 SAR Measurement System Setup

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

Frequency: 10 MHz to 6 GHz

Linearity: ±0.2dB (30 MHz to 6 GHz)

Dynamic: 10 mW/kg to 100 W/kg

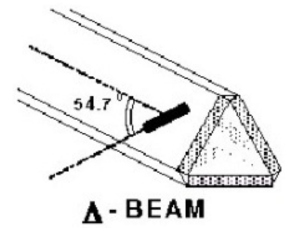


Figure 2.2 Triangular Probe Configurations

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/cm2.

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;

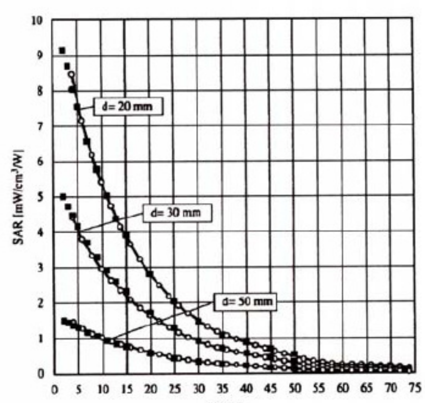


Figure 2.4 E-Field and Temperature Measurements at 900MHz

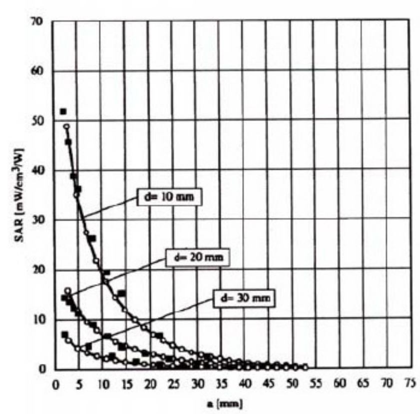


Figure 2.5 E-Field and Temperature Measurements at 1800MHz

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

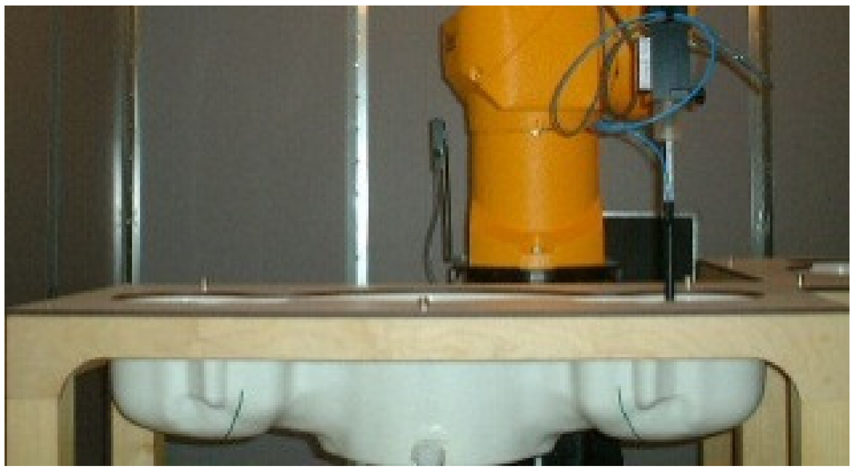


Figure 2.6 SAM Twin Phantom

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. Probe and Dipole Calibration

See Appendix D and E.

4. Phantom & Simulating Tissue Specifications

Head & Body Simulating Mixture Characterization

The head and body mixtures consist of the material based on the table listed below. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. Body tissue parameters that have not been specified in P1528 are derived from the issue dielectric parameters computed from the 4-Cole-Cole equations.

Table 4.1 Typical Composition of Ingredients for Tissue

Ingredients		Simulating Tissue					
		750 MHz Body	835 MHz Body	1750 MHz Body	1900 MHz Body	2300 MHz Body	2600 MHz Body
Mixing Percentage							
Water		Proprietary Purchased from Speag	52.50	Proprietary Purchased from Speag	69.91	Proprietary Purchased from Speag	Proprietary Purchased from Speag
Sugar			45.00		0.00		
Salt			1.40		0.13		
HEC			1.00		0.00		
Bactericide			0.10		0.00		
DGBE			0.00		29.96		
Dielectric Constant	Target	55.5	55.20	53.4	53.30	52.90	52.51
Conductivity (S/m)	Target	0.96	0.97	1.49	1.52	1.81	2.16

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

Uncontrolled Environment

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

Controlled Environment

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

Table 5.1 Human Exposure Limits

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

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

6. Measurement Uncertainty

Measurement uncertainty table is not required per KDB 865664 D01 v01r04 section 2.8.2 page 12. SAR measurement uncertainty analysis is required in the SAR report only when the highest measured SAR in a frequency band is ≥ 1.5 W/kg for 1-g SAR. The equivalent ratio (1.5/1.6) should be applied to extremity and occupational exposure conditions. The highest reported value is less than 1.5 W/kg. Therefore, the measurement uncertainty table is not required.

7. System Validation

Tissue Verification

Table 7.1 Measured Tissue Parameters

		750 MHz Body		835 MHz Body		1750 MHz Body	
Date(s)		Aug. 15, 2016		Aug. 22, 2016		Aug. 22, 2016	
Liquid Temperature (˚C)	20.0	Target	Measured	Target	Measured	Target	Measured
Dielectric Constant: ε		55.53	55.57	55.20	55.91	53.43	53.32
Conductivity: σ		0.96	0.99	0.97	0.99	1.49	1.52
		1900 MHz Body		2300 MHz Body		2600 MHz Body	
Date(s)		Aug. 17, 2016		Aug. 19, 2016		Aug. 19, 2016	
Liquid Temperature (˚C)	20.0	Target	Measured	Target	Measured	Target	Measured
Dielectric Constant: ε		53.30	52.07	52.90	52.63	52.51	52.38
Conductivity: σ		1.52	1.47	1.81	1.84	2.16	2.21
		2600 MHz Body		1750 MHz Body		2600 MHz Body	
Date(s)		Nov. 21, 2016		Nov. 29, 2016		Nov. 29, 2016	
Liquid Temperature (˚C)	20.0	Target	Measured	Target	Measured	Target	Measured
Dielectric Constant: ε		52.51	52.23	53.43	52.68	52.51	52.21
Conductivity: σ		2.16	2.15	1.49	1.56	2.16	2.18

See Appendix A for data of all the channel frequencies tested.

Test System Verification

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

Table 7.2 System Dipole Validation Target & Measured

	Test Frequency	Targeted SAR_{1g} (W/kg)	Measure SAR_{1g} (W/kg)	Tissue Used for Verification	Deviation Target and Fast SAR to SAR (%)	Plot Number
15-Aug-2016	750 MHz	8.47	8.65	Body	+ 2.13	1
22-Aug-2016	835 MHz	9.28	9.53	Body	+ 2.69	2
22-Aug-2016	1750 MHz	37.70	38.50	Body	+ 2.12	3
17-Aug-2016	1900 MHz	40.40	39.80	Body	- 1.49	4
19-Aug-2016	2300 MHz	48.10	48.20	Body	+ 0.21	5
19-Aug-2016	2600 MHz	54.80	54.10	Body	- 1.28	6
21-Nov-2016	2600 MHz	54.80	52.20	Body	- 4.74	7
29-Nov-2016	1750 MHz	37.70	38.20	Body	+ 1.32	8
29-Nov-2016	2600 MHz	54.80	53.50	Body	- 2.37	9

See Appendix A for data plots.

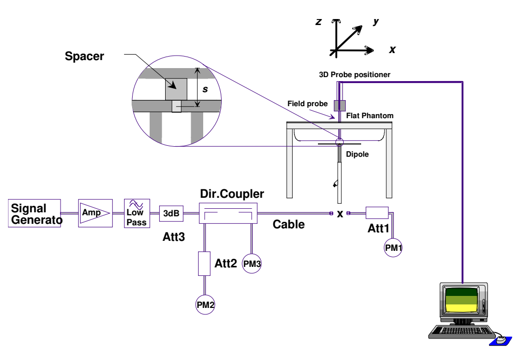


Figure 7.1 Dipole Validation Test Setup

8. SAR Test Data Summary

See Measurement Result Data Pages

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

Procedures Used To Establish Test Signal

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

Device Test Condition

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

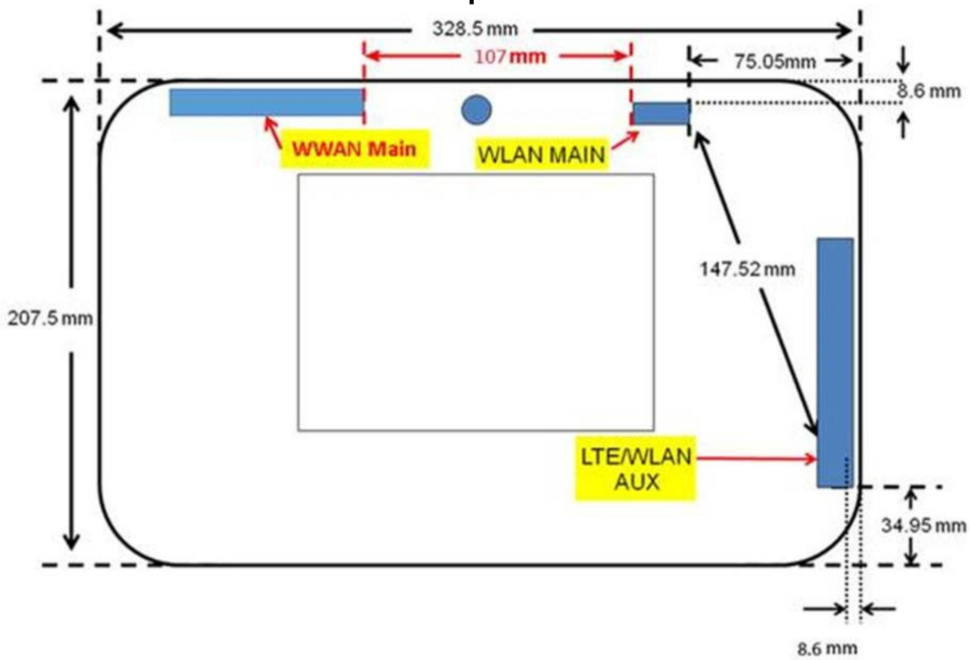
The EUT was tested in the tablet configuration of the device. The EUT was tested in on all sides of the device where the antenna was within 25 mm of that side. All measurements for the tablet condition were conducted with the side of the device in direct contact with the phantom.

The Bluetooth transmitter does simultaneously transmit with the WiFi transmitter and the WWAN transmitter simultaneously transmits with both WiFi and BT. When the BT is turned on, it transmits on Aux and the WiFi transmits on Main. Simultaneous transmission is evaluated on page 72.

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

The WCDMA testing was conducted using 12.2 kbps RMC configured in Test Loop Mode 1. The HSPA testing was conducted with HS-DPCCH, E-DPCCH and E-DPDCH all enabled and a 12.2 kbps RMC. FRC was configured according to HS-DPCCH Sub-Test 1 using H-set 1 and QPSK.

Location and Separation Distances



9. 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	
4	1710-1755	2110-2155	FDD
5 & 26	814-849	859-894	FDD
13	777-787	746-756	FDD
12	704-716	734-746	FDD
2 & 25	1850-1915	1930-1995	FDD
30	2305-2315	2350-2360	FDD
7	2500-2570	2620-2690	FDD
41	2496-2690	2496-2690	TDD

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)
4	1.4, 3, 5, 10, 15, 20	1710-1755
5	1.4, 3, 5, 10	824-849
26	1.4, 3, 5, 10, 15	814-849
13	5, 10	777-787
12	1.4, 3, 5, 10	704-716
2 & 25	1.4, 3, 5, 10, 15, 20	1850-1915
30	5, 10	2305-2315
7	5, 10, 15, 20	2500-2570
41	5, 10, 15, 20	2496-2690

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	
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
26	1.4	814.7	26697	831.5	26865	848.3	27033
26	3	815.5	26705	831.5	26865	847.5	27025

26	5	816.5	26715	831.5	26865	846.5	27015
26	10	819.0	26740	831.5	26865	844.0	26990
26	15	821.5	24765	831.5	26865	841.5	26995
13	5	779.5	23205	782.0	23230	784.5	23255
13	10	-----	-----	782.0	23230	-----	-----
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
2 & 25	1.4	1850.7	18607	1882.5	26365	1914.3	26715
2 & 25	3	1851.5	18615	1882.5	26365	1913.5	26690
2 & 25	5	1852.5	18625	1882.5	26365	1912.5	26665
2 & 25	10	1855.0	18650	1882.5	26365	1910.0	26640
2 & 25	15	1857.5	18675	1882.5	26365	1907.5	26615
2 & 25	20	1860.0	18700	1882.5	26365	1905.0	26590
30	5	2307.5	27685	2310	27710	2312.5	27735
30	10	-----	-----	2310	27710	-----	-----
7	5	2502.5	20775	2535	21100	2567.5	21425
7	10	2505.0	20800	2535	21100	2565.0	21400
7	15	2507.5	20825	2535	21100	2562.5	21375
7	20	2510.0	20850	2535	21100	2560.0	21350
41	5	2498.5	39675	2593	40620	2687.5	41565
41	10	2501.0	39700	2593	40620	2685.0	41540
41	15	2503.5	39725	2593	40620	2682.5	41515
41	20	2506.0	39750	2593	40620	2680.0	41490

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 2 antennas:
   - WWAN Main Antenna
   - WWAN Diversity Antenna

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

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

7) 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

A-MPR was disabled during testing.

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

The maximum average conducted output power for the testing is listed on pages 33-60 of this report. The below table shows the factory set point with the allowable tolerance.

LTE Band	Power Class	Modulation	Factory Conducted Power (dBm)	
			Set point	Tolerance (+/-)
4	3	QPSK	23.0	+1.0/-1.5
4	3	16QAM	22.0	+1.0/-1.5
5 & 26	3	QPSK	23.0	+1.0/-1.5
5 & 26	3	16QAM	22.0	+1.0/-1.5
13	3	QPSK	23.0	+1.0/-1.5
13	3	16QAM	22.0	+1.0/-1.5
12	3	QPSK	23.0	+1.0/-1.5
12	3	16QAM	22.0	+1.0/-1.5
2 & 25	3	QPSK	23.0	+1.0/-1.5
2 & 25	3	16QAM	22.0	+1.0/-1.5
30	3	QPSK	22.0	+1.0/-1.5
30	3	16QAM	21.0	+1.0/-1.5
7	3	QPSK	22.0	+1.0/-1.5
7	3	16QAM	21.0	+1.0/-1.5
41	3	QPSK	23.0	+1.0/-1.5
41	3	16QAM	22.0	+1.0/-1.5

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:

Band	Technology	Class	Setpoint Nominal Power dBm	Tolerance dBm	Lower Tolerance dBm	Upper Tolerance dBm
Band 5 – 850 MHz	UMTS	3	22	+1.0/-1.5	20.5	23.0
Band 4 – 1750 MHz	UMTS	3	21	+1.0/-1.5	19.5	22.0
Band 2 – 1900 MHz	UMTS	3	20	+1.0/-1.5	18.5	21.0
WLAN – 2.4 GHz	802.11b	N/A	16	±1.5	14.5	17.5
WLAN – 2.4 GHz	802.11g/n(Ch. 6)	N/A	16	±1.5	14.5	17.5
WLAN – 5 GHz Band I, II, III, IV	802.11a	N/A	14.5	±1.5	13.0	16.0

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

The maximum average conducted output power measured for the testing is listed on pages 26-30 of this report. The table in item 9 shows the factory set point with the allowable tolerance.

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

Power reduction is not required to satisfy SAR compliance.

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

Power reduction is not required to satisfy SAR compliance.

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

Power reduction is not required to satisfy SAR compliance.

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

Not applicable.

10. FCC 3G Measurement Procedures

Power measurements were performed using a base station simulator under average power.

10.1 Procedures Used to Establish RF Signal for SAR

The device was placed into a simulated call using a base station simulator in a screen room. Such test signals offer a consistent means for testing SAR and recommended for evaluating SAR. The SAR measurement software calculates a reference point at the start and end of the test to check for power drifts. If conducted power deviations of more than 5% occurred, the tests were repeated.

10.2 SAR Measurement Conditions for WCDMA/HSDPA/HSUPA

Configure the call box 8960 to support all WCDMA tests in respect to the 3GPP 34.121 (listed in Table below). Measure the power at Ch4132, 4182 and 4233 for US cell; Ch9262, 9400 and 9538 for US PCS band.

For Rel99

- Set a Test Mode 1 loop back with a 12.2kbps Reference Measurement Channel (RMC).
- Set and send continuously Up power control commands to the device
- Measure the power at the device antenna connector using the power meter with average detector.

For HSDPA Rel 6

- Establish a Test Mode 1 look back with both 1 12.2kbps RMC channel and a H-Set1 Fixed Reference Channel (FRC). With the 8960 this is accomplished by setting the signal Channel Coding to “Fixed Reference Channel” and configuring for HSET-1 QKSP.
- Set beta values and HSDPA settings for HSDPA Subtest1 according to Table below.
- Send continuously Up power control commands to the device
- Measure the power at the device antenna connector using the power meter with modulated average detector.
- Repeat the measurement for the HSDPA Subtest2, 3 and 4 as given in Table below.

For HSUPA Rel 6

- Use UL RMC 12.2kbps and FRC H-Set1 QPSK, Test Mode 1 loop back. With the 8960 this is accomplished by setting the signal Channel Coding to “E-DCH Test Channel” and configuring the equipment category to Cat5_10ms.
- Set the Absolute Grant for HSUPA Subtest1 according to Table below.
- Set the device power to be at least 5dB lower than the Maximum output power
- Send power control bits to give one TPC_cmd = +1 command to the device. If device doesn’t send any E-DPCH data with decreased E-TFCI within 500ms, then repeat this process until the decreased E-TFCI is reported.
- Confirm that the E-TFCI transmitted by the device is equal to the target E-TFCI in Table below. If the E-TFCI transmitted by the device is not equal to the target E-TFCI, then send power control bits to give one TPC_cmd = -1 command to the UE. If UE sends any E-DPCH data with decreased E-TFCI within 500 ms, send new power control bits to give one TPC_cmd = -1 command to the UE. Then confirm that the E-TFCI transmitted by the UE is equal to the target E-TFCI in Table below.
- Measure the power using the power meter with modulated average detector.
- Repeat the measurement for the HSUPA Subtest2, 3, 4 and 5 as given in Table below.

3GPP Release Version	Mode	Cellular Band [dBm]			Sub-Test (See Table Below)	MPR
		4132	4183	4233		
99	WCDMA	22.89	22.91	22.87	-	-
6	HSDPA	22.86	22.87	22.79	1	0
6		22.82	22.89	22.85	2	0
6		22.39	22.42	22.37	3	0.5
6		22.94	22.49	22.40	4	0.5
6	HSUPA	22.80	22.90	22.83	1	0
6		20.95	20.99	20.96	2	2
6		21.97	22.08	21.99	3	1
6		21.06	21.01	21.04	4	2
6		22.82	22.84	22.87	5	0

3GPP Release Version	Mode	PCS Band [dBm]			Sub-Test (See Table Below)	MPR
		9262	9400	9538		
99	WCDMA	20.83	20.86	20.81	-	-
6	HSDPA	20.79	20.82	20.76	1	0
6		20.81	20.75	20.79	2	0
6		20.36	20.34	20.36	3	0.5
6		20.41	20.31	20.39	4	0.5
6	HSUPA	20.84	20.82	20.75	1	0
6		18.97	19.01	18.89	2	2
6		19.94	20.05	19.94	3	1
6		18.99	18.95	19.03	4	2
6		20.82	20.80	20.71	5	0

3GPP Release Version	Mode	AWS Band [dBm]			Sub-Test (See Table Below)	MPR
		1312	1413	1513		
99	WCDMA	21.88	21.95	21.90	-	-
6	HSDPA	21.82	21.86	21.74	1	0
6		21.74	21.72	21.76	2	0
6		21.45	21.39	21.38	3	0.5
6		21.43	21.34	21.35	4	0.5
6	HSUPA	21.80	21.80	21.77	1	0
6		19.98	20.06	19.84	2	2
6		20.92	21.01	20.98	3	1
6		19.97	19.92	20.05	4	2
6		21.85	21.87	21.68	5	0

Sub-Test Setup for Release 6 HSDPA

Sub-Test	β_c	β_d	B_c/β_d	β_{hs}
1	2/15	15/15	2/15	4/15
2	12/15	15/15	15/15	24/15
3	15/15	8/15	15/8	30/15
4	15/15	4/15	15/4	30/15
Δ_{ack}, Δ_{nack} and Δ_{cqi} = 8				

Sub-Test Setup for Release 6 HSUPA

Sub-Test	β_c	β_d	B_c/β_d	β_{hs}	B_{ec}	B_{ed}	MPR	AG Index	E-TFCI
1	11/15	15/15	11/15	22/15	209/225	1039/225	0.0	20	75
2	6/15	15/15	6/15	12/15	12/15	94/75	2.0	12	67
3	15/15	9/15	15/9	30/15	30/15	47/15	1.0	15	92
4	2/15	15/15	2/15	4/15	2/15	56/15	2.0	17	71
5	15/15	15/15	15/15	30/15	24/15	134/15	0.0	21	81
Δ_{ack}, Δ_{nack} and Δ_{cqi} = 8									

Band	Mode	Bandwidth (MHz)	Channel	Frequency (MHz)	Data Rate	Antenna	Power (dBm)
2450 MHz	802.11b	20	1	2412	1 Mbps	Chain A	16.41
			6	2437			17.50
			11	2462			17.50
			1	2412		Chain B	16.45
			6	2437			17.50
			11	2462			17.50
	802.11g	20	1	2412	6 Mbps	Chain A	13.87
			6	2437			17.48
			11	2462			12.46
			1	2412		Chain B	14.45
			6	2437			17.49
			11	2462			12.42
	802.11n	20	1	2412	HT4	Chain A	13.92
			6	2437			17.47
			11	2462			12.39
			1	2412		Chain B	14.41
			6	2437			17.42
			11	2462			12.46
	802.11n	40	3	2422	HT4	Chain A	13.42
			6	2437			17.45
			9	2452			12.48
			3	2422		Chain B	13.41
			6	2437			17.46
			9	2452			11.47
5.15-5.25 GHz	802.11a	20	36	5180	6 Mbps	Chain A	13.92
			40	5200			15.47
			44	5220			15.50
			48	5240			15.46
			36	5180		Chain B	13.96
			40	5200			15.92
			44	5220			16.00
			48	5240			15.99
	802.11n	20	36	5180	HT4	Chain A	13.89
			40	5200			15.43
			44	5220			15.46
			48	5240			15.42
			36	5180		Chain B	13.98
			40	5200			15.85
			44	5220			15.93
			48	5240			15.90
	802.11n	40	38	5190	HT4	Chain A	11.96
			46	5230			15.92
			38	5190	HT4	Chain B	13.46
			46	5230			15.90
	802.11ac	80	42	5210	VHT6	Chain A	13.50
						Chain B	13.50
5.25-5.35 GHz	802.11a	20	52	5260	6 Mbps	Chain A	15.38
			56	5280			15.50
			60	5300			15.50
			64	5320			13.46
			52	5260		Chain B	15.94
			56	5280			16.00
			60	5300			16.00
			64	5320			13.41
	802.11n	20	52	5260	HT4	Chain A	15.42
			56	5280			15.44
			60	5300			15.49
			64	5320			13.40
			52	5260		Chain B	15.91
			56	5280			15.88
			60	5300			15.96
			64	5320			13.43
	802.11n	40	54	5270	HT4	Chain A	15.90
			62	5310			13.46
			54	5270	HT4	Chain B	15.94
			62	5310			13.39
	802.11ac	80	58	5290	VHT6	Chain A	13.46
						Chain B	13.43

Band	Mode	Bandwidth (MHz)	Channel	Frequency (MHz)	Data Rate	Antenna	Power (dBm)
5600 MHz	802.11a	20	100	5500	6 Mbps	Chain A	13.46
			104	5520			15.39
			108	5540			15.46
			112	5560			15.41
			116	5580			15.50
			120	5600			15.44
			124	5620			15.50
			128	5640			15.41
			132	5660			15.41
			136	5680			15.43
			140	5700			12.90
			100	5500		Chain B	13.94
			104	5520			15.92
			108	5540			15.90
			112	5560			15.95
			116	5580			16.00
			120	5600			15.89
			124	5620			16.00
			128	5640			15.92
			132	5660			15.92
			136	5680			15.91
			140	5700			12.94
	802.11n	20	100	5500	HT4	Chain A	13.37
			104	5520			15.42
			108	5540			15.38
			112	5560			15.46
			116	5580			15.48
			120	5600			15.44
			124	5620			15.47
			128	5640			15.40
			132	5660			15.39
			136	5680			15.46
			140	5700			12.87
			100	5500		Chain B	13.42
			104	5520			15.96
			108	5540			15.92
			112	5560			15.90
			116	5580			15.93
			120	5600			15.97
			124	5620			15.89
			128	5640			15.87
			132	5660			15.94
			136	5680			15.82
			140	5700			12.91
	802.11n	40	102	5510	HT4	Chain A	13.42
			110	5550			15.96
			118	5580			15.89
			126	5610			15.92
			134	5670			15.87
			102	5510		Chain B	13.91
			110	5550			15.92
			118	5580			15.90
			126	5610			15.85
			134	5670			15.96
	802.11ac	20	144	5720	VHT0	Chain A	15.43
						Chain B	14.96
		40	142	5710		Chain A	15.94
						Chain B	15.96
		80	106	5530	VHT6	Chain A	13.46
			122	5610			14.93
			138	5690			14.91
			106	5530		Chain B	13.46
			122	5610			13.45
			138	5690			11.42

Band	Mode	Bandwidth (MHz)	Channel	Frequency (MHz)	Data Rate	Antenna	Power (dBm)
5800 MHz	802.11a	20	149	5745	6 Mbps	Chain A	15.42
			153	5765			15.48
			157	5785			15.50
			161	5805			15.44
			165	5825			15.50
			149	5745		Chain B	15.96
			153	5765			15.91
			157	5785			16.00
			161	5805			15.95
			165	5825			16.00
	802.11n	20	149	5745	HT8	Chain A	15.44
			153	5765			15.46
			157	5785			15.49
			161	5805			15.42
			165	5825			15.38
			149	5745		Chain B	15.96
			153	5765			15.91
			157	5785			15.90
			161	5805			15.93
			165	5825			15.97
	802.11n	40	151	5755	HT8	Chain A	15.92
			159	5795			15.88
			151	5755		Chain B	15.86
			159	5795			15.90
	802.11ac	80	155	5775	VHT6	Chain A	14.98
						Chain B	13.95

Figure 10.1 Test Reduction Table – WCDMA

Band/ Frequency (MHz)	Technology	Test Position	Required Channel	Tested/ Reduced
Band 2 1850-1910 MHz	WCDMA	Top	9262	Tested
			9400	Tested
			9538	Tested
		Back	9262	Reduced[1]
			9400	Tested
			9538	Reduced[1]
		Side	9262	Reduced[1]
			9400	Tested
			9538	Reduced[1]
Band 5 824-849 MHz		Top	4132	Reduced[1]
			4183	Tested
			4233	Reduced[1]
		Back	4132	Tested
			4183	Tested
			4233	Tested
		Side	4132	Reduced[1]
			4183	Tested
			4233	Reduced[1]
Band 4 1710-1755 MHz		Top	1312	Reduced[1]
			1413	Tested
			1513	Reduced[1]
		Back	1312	Reduced[1]
			1413	Tested
			1513	Reduced[1]
		Side	1312	Reduced[1]
			1413	Tested
			1513	Reduced[1]

Reduced[1] – When the mid channel is 3 dB (0.8 W/kg) below the limit, the remaining channels are not required per KDB 447498 D01 v06 section 4.3.3 page 14.

11.4 SAR Measurement Conditions for LTE Bands

11.4.1 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)
4	1.4, 3, 5, 10, 15, 20	1710-1755
5	1.4, 3, 5, 10	824-849
26	1.4, 3, 5, 10, 15	814-849
13	5, 10	777-787
12	1.4, 3, 5, 10	704-716
2 & 25	1.4, 3, 5, 10, 15, 20	1850-1915
30	5, 10	2305-2315
7	5, 10, 15, 20	2500-2570
41	5, 10, 15, 20	2496-2690

11.4.2 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.

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
4	QPSK	1.4 MHz	6	0	19957	1710.7	20.2
					20175	1732.5	20.1
					20393	1754.3	20.2
			3	1	19957	1710.7	21.0
					20175	1732.5	21.0
					20393	1754.3	21.0
			1	0	19957	1710.7	21.0
					20175	1732.5	20.9
					20393	1754.3	20.9
			1	5	19957	1710.7	21.0
					20175	1732.5	21.0
					20393	1754.3	20.9
		3 MHz	15	0	19965	1711.5	20.3
					20175	1732.5	20.4
					20385	1753.5	20.2
			8	3	19965	1711.5	20.1
					20175	1732.5	20.1
					20385	1753.5	20.2
			1	0	19965	1711.5	21.0
					20175	1732.5	21.0
					20385	1753.5	20.9
			1	14	19965	1711.5	21.0
					20175	1732.5	21.0
					20385	1753.5	21.0
		5 MHz	25	0	19975	1712.5	20.3
					20175	1732.5	20.3
					20375	1752.5	20.2
			12	6	19975	1712.5	20.1
					20175	1732.5	20.3
					20375	1752.5	20.2
			1	0	19975	1712.5	21.0
					20175	1732.5	21.0
					20375	1752.5	21.0
			1	24	19975	1712.5	21.0
					20175	1732.5	21.0
					20375	1752.5	20.9

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
4	QPSK	10 MHz	50	0	20000	1715	20.1
					20175	1732.5	20.2
					20350	1750	20.3
			25	12	20000	1715	20.2
					20175	1732.5	20.3
					20350	1750	20.4
			1	0	20000	1715	21.0
					20175	1732.5	21.0
					20350	1750	21.0
			1	24	20000	1715	21.0
					20175	1732.5	21.0
					20350	1750	21.0
		15 MHz	75	0	20025	1717.5	20.1
					20175	1732.5	20.2
					20325	1747.5	20.2
			36	19	20025	1717.5	20.2
					20175	1732.5	20.2
					20325	1747.5	20.2
			1	0	20025	1717.5	21.0
					20175	1732.5	21.0
					20325	1747.5	21.0
			1	74	20025	1717.5	21.0
					20175	1732.5	21.0
					20325	1747.5	21.0
		20 MHz	100	0	20050	1720	20.2
					20175	1732.5	20.2
					20300	1745	20.3
			50	25	20050	1720	20.1
					20175	1732.5	20.1
					20300	1745	20.3
			1	0	20050	1720	21.0
					20175	1732.5	21.0
					20300	1745	21.0
			1	99	20050	1720	21.0
					20175	1732.5	21.0
					20300	1745	21.0

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
4	16QAM	1.4 MHz	6	0	19957	1710.7	19.0
					20175	1732.5	19.0
					20393	1754.3	19.2
			3	1	19957	1710.7	20.1
					20175	1732.5	20.1
					20393	1754.3	20.2
			1	0	19957	1710.7	20.0
					20175	1732.5	20.0
					20393	1754.3	20.1
			1	5	19957	1710.7	20.1
					20175	1732.5	20.0
					20393	1754.3	20.1
		3 MHz	15	0	19965	1711.5	19.2
					20175	1732.5	19.3
					20385	1753.5	19.4
			8	3	19965	1711.5	19.1
					20175	1732.5	19.3
					20385	1753.5	19.2
			1	0	19965	1711.5	20.1
					20175	1732.5	20.0
					20385	1753.5	20.1
			1	14	19965	1711.5	20.3
					20175	1732.5	20.2
					20385	1753.5	20.4
		5 MHz	25	0	19975	1712.5	19.3
					20175	1732.5	19.2
					20375	1752.5	19.1
			12	6	19975	1712.5	19.3
					20175	1732.5	19.2
					20375	1752.5	19.4
			1	0	19975	1712.5	20.0
					20175	1732.5	20.0
					20375	1752.5	20.1
			1	24	19975	1712.5	20.0
					20175	1732.5	20.0
					20375	1752.5	20.1

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
4	16QAM	10 MHz	50	0	20000	1715	19.2
					20175	1732.5	19.1
					20350	1750	19.3
			25	12	20000	1715	19.3
					20175	1732.5	19.2
					20350	1750	19.4
			1	0	20000	1715	20.3
					20175	1732.5	20.2
					20350	1750	20.2
			1	24	20000	1715	20.3
					20175	1732.5	20.1
					20350	1750	20.2
		15 MHz	75	0	20025	1717.5	19.1
					20175	1732.5	19.0
					20325	1747.5	19.1
			36	19	20025	1717.5	19.3
					20175	1732.5	19.3
					20325	1747.5	19.2
			1	0	20025	1717.5	20.2
					20175	1732.5	20.3
					20325	1747.5	20.3
			1	74	20025	1717.5	20.1
					20175	1732.5	20.0
					20325	1747.5	20.2
		20 MHz	100	0	20050	1720	19.2
					20175	1732.5	19.1
					20300	1745	19.3
			50	25	20050	1720	19.1
					20175	1732.5	19.0
					20300	1745	19.2
			1	0	20050	1720	20.3
					20175	1732.5	20.4
					20300	1745	20.2
			1	99	20050	1720	20.1
					20175	1732.5	20.2
					20300	1745	20.2

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
5	QPSK	1.4 MHz	6	0	20407	824.7	23.0
					20525	836.5	23.0
					20643	848.3	23.1
			3	1	20407	824.7	24.0
					20525	836.5	23.9
					20643	848.3	24.0
			1	0	20407	824.7	23.9
					20525	836.5	24.0
					20643	848.3	24.0
			1	5	20407	824.7	24.0
					20525	836.5	23.9
					20643	848.3	24.0
		3 MHz	15	0	20415	825.5	23.0
					20525	836.5	22.9
					20635	847.5	23.1
			8	3	20415	825.5	23.0
					20525	836.5	23.1
					20635	847.5	23.1
			1	0	20415	825.5	23.9
					20525	836.5	24.0
					20635	847.5	24.0
			1	14	20415	825.5	24.0
					20525	836.5	24.0
					20635	847.5	24.0
		5 MHz	25	0	20425	826.5	23.1
					20525	836.5	22.9
					20625	846.5	23.1
			12	6	20425	826.5	23.0
					20525	836.5	23.1
					20625	846.5	23.1
			1	0	20425	826.5	23.8
					20525	836.5	24.0
					20625	846.5	24.0
			1	24	20425	826.5	24.0
					20525	836.5	24.0
					20625	846.5	24.0

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
5	QPSK	10 MHz	50	0	20450	829	22.9
					20525	836.5	22.8
					20600	844	22.8
			25	12	20450	829	23.0
					20525	836.5	22.9
					20600	844	23.0
			1	0	20450	829	24.0
					20525	836.5	24.0
					20600	844	23.9
			1	24	20450	829	23.9
					20525	836.5	24.0
					20600	844	24.0
	16QAM	1.4 MHz	6	0	20407	824.7	22.1
					20525	836.5	22.2
					20643	848.3	22.2
			3	1	20407	824.7	22.9
					20525	836.5	23.0
					20643	848.3	23.1
			1	0	20407	824.7	23.1
					20525	836.5	23.2
					20643	848.3	23.2
			1	5	20407	824.7	23.2
					20525	836.5	23.2
					20643	848.3	23.4
		3 MHz	15	0	20415	825.5	22.0
					20525	836.5	22.1
					20635	847.5	22.1
			8	3	20415	825.5	21.9
					20525	836.5	22.1
					20635	847.5	22.0
			1	0	20415	825.5	23.0
					20525	836.5	23.1
					20635	847.5	23.1
			1	14	20415	825.5	23.4
					20525	836.5	23.3
					20635	847.5	23.4

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
5	16QAM	5 MHz	25	0	20425	826.5	21.9
					20525	836.5	21.9
					20625	846.5	21.9
			12	6	20425	826.5	22.1
					20525	836.5	22.1
					20625	846.5	22.3
			1	0	20425	826.5	23.0
					20525	836.5	23.2
					20625	846.5	23.2
			1	24	20425	826.5	23.3
					20525	836.5	23.3
					20625	846.5	23.4
		10 MHz	50	0	20450	829	21.8
					20525	836.5	21.8
					20600	844	21.9
			25	12	20450	829	21.9
					20525	836.5	21.9
					20600	844	21.9
			1	0	20450	829	23.1
					20525	836.5	23.4
					20600	844	23.2
			1	24	20450	829	23.1
					20525	836.5	23.3
					20600	844	23.3

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
13	QPSK	5 MHz	25	0	23205	779.5	23.35
					23255	784.5	23.35
			12	6	23205	779.5	23.46
					23255	784.5	23.47
			1	0	23205	779.5	23.45
					23255	784.5	23.40
			1	24	23205	779.5	23.49
					23255	784.5	23.44
		10 MHz	50	0	23230	782.0	23.26
			25	13	23230	782.0	23.51
			1	0	23230	782.0	23.48
			1	49	23230	782.0	23.48
	16QAM	5 MHz	25	0	23205	779.5	22.33
					23255	784.5	22.32
			12	6	23205	779.5	22.58
					23255	784.5	22.66
			1	0	23205	779.5	23.48
					23255	784.5	23.55
			1	24	23205	779.5	23.64
					23255	784.5	23.57
		10 MHz	50	0	23230	782.0	22.20
			25	13	23230	782.0	22.48
			1	0	23230	782.0	23.38
			1	49	23230	782.0	23.30

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
25	QPSK	1.4 MHz	6	0	26047	1850.7	19.2
					26365	1882.5	19.1
					26683	1914.3	19.0
			3	1	26047	1850.7	20.0
					26365	1882.5	20.0
					26683	1914.3	19.8
			1	0	26047	1850.7	20.0
					26365	1882.5	20.0
					26683	1914.3	19.9
			1	5	26047	1850.7	20.0
					26365	1882.5	20.0
					26683	1914.3	19.8
		3 MHz	15	0	26055	1851.5	19.1
					26365	1882.5	19.1
					26675	1913.5	18.9
			8	3	26055	1851.5	19.4
					26365	1882.5	19.3
					26675	1913.5	19.2
			1	0	26055	1851.5	20.0
					26365	1882.5	20.0
					26675	1913.5	19.9
			1	14	26055	1851.5	20.0
					26365	1882.5	20.0
					26675	1913.5	19.9
		5 MHz	25	0	26065	1852.5	19.1
					26365	1882.5	19.0
					26665	1912.5	18.9
			12	6	26065	1852.5	19.2
					26365	1882.5	19.0
					26665	1907.5	19.1
			1	0	26065	1852.5	20.0
					26365	1882.5	20.0
					26665	1907.5	20.0
			1	24	26065	1852.5	20.0
					26365	1882.5	20.0
					26665	1907.5	19.8

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
25	QPSK	10 MHz	50	0	26090	1855	19.2
					26365	1882.5	19.0
					26640	1910	19.0
			25	12	26090	1855	19.2
					26365	1882.5	19.0
					26640	1910	19.1
			1	0	26090	1855	20.0
					26365	1882.5	20.0
					26640	1910	20.0
			1	24	26090	1855	20.0
					26365	1882.5	20.0
					26640	1910	19.9
		15 MHz	75	0	26115	1857.5	19.2
					26365	1882.5	19.0
					26615	1907.5	19.1
			36	19	26115	1857.5	19.2
					26365	1882.5	19.0
					26615	1907.5	19.0
			1	0	26115	1857.5	20.0
					26365	1882.5	20.0
					26615	1907.5	20.0
			1	74	26115	1857.5	20.0
					26365	1882.5	20.0
					26615	1907.5	19.8
		20 MHz	100	0	26140	1860	19.0
					26365	1882.5	19.0
					26590	1905	19.2
			50	25	26140	1860	18.9
					26365	1882.5	19.0
					26590	1905	19.1
			1	0	26140	1860	20.0
					26365	1882.5	20.0
					26590	1905	20.0
			1	99	26140	1860	20.0
					26365	1882.5	20.0
					26590	1905	19.9

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
25	16QAM	1.4 MHz	6	0	26047	1850.7	18.1
					26365	1882.5	17.9
					26683	1914.3	18.0
			3	1	26047	1850.7	19.0
					26365	1882.5	18.9
					26683	1914.3	19.0
			1	0	26047	1850.7	19.2
					26365	1882.5	19.3
					26683	1914.3	19.1
			1	5	26047	1850.7	19.0
					26365	1882.5	18.9
					26683	1914.3	19.0
		3 MHz	15	0	26055	1851.5	18.2
					26365	1882.5	18.0
					26675	1913.5	18.2
			8	3	26055	1851.5	18.2
					26365	1882.5	17.9
					26675	1913.5	18.1
			1	0	26055	1851.5	19.2
					26365	1882.5	19.3
					26675	1913.5	19.1
			1	14	26055	1851.5	19.0
					26365	1882.5	19.2
					26675	1913.5	19.1
		5 MHz	25	0	26065	1852.5	18.3
					26365	1882.5	18.2
					26665	1912.5	18.2
			12	6	26065	1852.5	18.0
					26365	1882.5	18.0
					26665	1907.5	18.2
			1	0	26065	1852.5	19.1
					26365	1882.5	19.0
					26665	1907.5	19.0
			1	24	26065	1852.5	18.9
					26365	1882.5	19.1
					26665	1907.5	19.0

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
25	16QAM	10 MHz	50	0	26090	1855	18.2
					26365	1882.5	18.3
					26640	1910	18.1
			25	12	26090	1855	18.3
					26365	1882.5	18.2
					26640	1910	18.1
			1	0	26090	1855	19.1
					26365	1882.5	19.3
					26640	1910	19.2
			1	24	26090	1855	19.2
					26365	1882.5	19.0
					26640	1910	19.0
		15 MHz	75	0	26115	1857.5	18.0
					26365	1882.5	18.1
					26615	1907.5	17.9
			36	19	26115	1857.5	18.1
					26365	1882.5	18.1
					26615	1907.5	17.9
			1	0	26115	1857.5	19.2
					26365	1882.5	19.3
					26615	1907.5	19.3
			1	74	26115	1857.5	19.1
					26365	1882.5	19.2
					26615	1907.5	19.0
		20 MHz	100	0	26140	1860	18.1
					26365	1882.5	18.0
					26590	1905	17.9
			50	25	26140	1860	18.1
					26365	1882.5	18.2
					26590	1905	18.1
			1	0	26140	1860	19.3
					26365	1882.5	19.3
					26590	1905	19.2
			1	99	26140	1860	19.1
					26365	1882.5	19.2
					26590	1905	19.0

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
26	QPSK	1.4 MHz	6	0	26697	814.7	23.2
					26865	831.5	23.1
					27033	848.3	23.2
			3	1	26697	814.7	24.0
					26865	831.5	24.0
					27033	848.3	24.0
			1	0	26697	814.7	24.0
					26865	831.5	23.9
					27033	848.3	23.9
			1	5	26697	814.7	24.0
					26865	831.5	24.0
					27033	848.3	23.9
		3 MHz	15	0	26705	815.5	23.3
					26865	831.5	23.4
					27025	847.5	23.2
			8	3	26705	815.5	23.1
					26865	831.5	23.1
					27025	847.5	23.2
			1	0	26705	815.5	24.0
					26865	831.5	24.0
					27025	847.5	23.9
			1	14	26705	815.5	24.0
					26865	831.5	24.0
					27025	847.5	24.0
		5 MHz	25	0	26715	816.5	23.3
					26865	831.5	23.3
					27015	846.5	23.2
			12	6	26715	816.5	23.1
					26865	831.5	23.3
					27015	846.5	23.2
			1	0	26715	816.5	24.0
					26865	831.5	24.0
					27015	846.5	24.0
			1	24	26715	816.5	24.0
					26865	831.5	24.0
					27015	846.5	23.9

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
26	QPSK	10 MHz	50	0	26740	819.0	23.1
					26865	831.5	23.2
					26990	844.0	23.3
			25	12	26740	819.0	23.2
					26865	831.5	23.3
					26990	844.0	23.4
			1	0	26740	819.0	24.0
					26865	831.5	24.0
					26990	844.0	24.0
			1	24	26740	819.0	24.0
					26865	831.5	24.0
					26990	844.0	24.0
		15 MHz	75	0	24765	821.5	23.1
					26865	831.5	23.2
					26995	841.5	23.2
			36	19	24765	821.5	23.2
					26865	831.5	23.2
					26995	841.5	23.2
			1	0	24765	821.5	24.0
					26865	831.5	24.0
					26995	841.5	24.0
			1	74	24765	821.5	24.0
					26865	831.5	24.0
					26995	841.5	24.0

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
26	16QAM	1.4 MHz	6	0	26697	814.7	22.0
					26865	831.5	22.0
					27033	848.3	22.2
			3	1	26697	814.7	23.1
					26865	831.5	23.1
					27033	848.3	23.2
			1	0	26697	814.7	23.0
					26865	831.5	23.0
					27033	848.3	23.1
			1	5	26697	814.7	23.1
					26865	831.5	23.0
					27033	848.3	23.1
		3 MHz	15	0	26705	815.5	22.2
					26865	831.5	22.3
					27025	847.5	22.4
			8	3	26705	815.5	22.1
					26865	831.5	22.3
					27025	847.5	22.2
			1	0	26705	815.5	23.1
					26865	831.5	23.0
					27025	847.5	23.1
			1	14	26705	815.5	23.3
					26865	831.5	23.2
					27025	847.5	23.4
		5 MHz	25	0	26715	816.5	22.3
					26865	831.5	22.2
					27015	846.5	22.1
			12	6	26715	816.5	22.3
					26865	831.5	22.2
					27015	846.5	22.4
			1	0	26715	816.5	23.0
					26865	831.5	23.0
					27015	846.5	23.1
			1	24	26715	816.5	23.0
					26865	831.5	23.0
					27015	846.5	23.1

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
26	16QAM	10 MHz	50	0	26740	819.0	22.2
					26865	831.5	22.1
					26990	844.0	22.3
			25	12	26740	819.0	22.3
					26865	831.5	22.2
					26990	844.0	22.4
			1	0	26740	819.0	23.3
					26865	831.5	23.2
					26990	844.0	23.2
			1	24	26740	819.0	23.3
					26865	831.5	23.1
					26990	844.0	23.2
		15 MHz	75	0	24765	821.5	22.1
					26865	831.5	22.0
					26995	841.5	22.1
			36	19	24765	821.5	22.3
					26865	831.5	22.3
					26995	841.5	22.2
			1	0	24765	821.5	23.2
					26865	831.5	23.3
					26995	841.5	23.3
			1	74	24765	821.5	23.1
					26865	831.5	23.0
					26995	841.5	23.2

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
12	QPSK	1.4 MHz	6	0	23017	699.7	22.0
					23095	707.5	22.0
					23173	715.3	22.1
			3	1	23017	699.7	23.0
					23095	707.5	22.9
					23173	715.3	23.0
			1	0	23017	699.7	22.9
					23095	707.5	23.0
					23173	715.3	23.0
			1	5	23017	699.7	23.0
					23095	707.5	22.9
					23173	715.3	23.0
		3 MHz	15	0	23025	700.5	22.0
					23095	707.5	21.9
					23165	714.5	22.1
			8	3	23025	700.5	22.0
					23095	707.5	22.1
					23165	714.5	22.1
			1	0	23025	700.5	22.9
					23095	707.5	23.0
					23165	714.5	23.0
			1	14	23025	700.5	23.0
					23095	707.5	23.0
					23165	714.5	23.0
		5 MHz	25	0	23035	701.5	22.1
					23095	707.5	21.9
					23155	713.5	22.1
			12	6	23035	701.5	22.0
					23095	707.5	22.1
					23155	713.5	22.1
			1	0	23035	701.5	22.8
					23095	707.5	23.0
					23155	713.5	23.0
			1	24	23035	701.5	23.0
					23095	707.5	23.0
					23155	713.5	23.0

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
12	QPSK	10 MHz	50	0	23060	704.0	21.9
					23095	707.5	21.8
					23130	711.0	21.8
			25	12	23060	704.0	22.0
					23095	707.5	21.9
					23130	711.0	22.0
			1	0	23060	704.0	23.0
					23095	707.5	23.0
					23130	711.0	22.9
			1	24	23060	704.0	22.9
					23095	707.5	23.0
					23130	711.0	23.0
	16QAM	1.4 MHz	6	0	23017	699.7	21.1
					23095	707.5	21.2
					23173	715.3	21.2
			3	1	23017	699.7	21.9
					23095	707.5	22.0
					23173	715.3	22.1
			1	0	23017	699.7	22.1
					23095	707.5	22.2
					23173	715.3	22.2
			1	5	23017	699.7	22.2
					23095	707.5	22.2
					23173	715.3	22.4
		3 MHz	15	0	23025	700.5	21.0
					23095	707.5	21.1
					23165	714.5	21.1
			8	3	23025	700.5	20.9
					23095	707.5	21.1
					23165	714.5	21.0
			1	0	23025	700.5	22.0
					23095	707.5	22.1
					23165	714.5	22.1
			1	14	23025	700.5	22.4
					23095	707.5	22.3
					23165	714.5	22.4

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
12	16QAM	5 MHz	25	0	23035	701.5	20.9
					23095	707.5	20.9
					23155	713.5	20.9
			12	6	23035	701.5	21.1
					23095	707.5	21.1
					23155	713.5	21.3
			1	0	23035	701.5	22.0
					23095	707.5	22.2
					23155	713.5	22.2
			1	24	23035	701.5	22.3
					23095	707.5	22.3
					23155	713.5	22.4
		10 MHz	50	0	23060	704.0	20.8
					23095	707.5	20.8
					23130	711.0	20.9
			25	12	23060	704.0	20.9
					23095	707.5	20.9
					23130	711.0	20.9
			1	0	23060	704.0	22.1
					23095	707.5	22.4
					23130	711.0	22.2
			1	24	23060	704.0	22.1
					23095	707.5	22.3
					23130	711.0	22.3

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
30	QPSK	5 MHz	25	0	27685	2307.5	20.4
					27735	2312.5	20.4
			12	6	27685	2307.5	20.5
					27735	2312.5	20.5
			1	0	27685	2307.5	20.5
					27735	2312.5	20.4
			1	24	27685	2307.5	20.5
					27735	2312.5	20.4
		10 MHz	50	0	27710	2310	20.3
			25	13	27710	2310	20.5
			1	0	27710	2310	20.5
			1	49	27710	2310	20.5
	16QAM	5 MHz	25	0	27685	2307.5	19.3
					27735	2312.5	19.3
			12	6	27685	2307.5	19.6
					27735	2312.5	19.7
			1	0	27685	2307.5	19.5
					27735	2312.5	19.6
			1	24	27685	2307.5	19.6
					27735	2312.5	19.6
		10 MHz	50	0	27710	2310	19.2
			25	13	27710	2310	19.5
			1	0	27710	2310	19.4
			1	49	27710	2310	19.3

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
7	QPSK	5 MHz	25	0	20775	2502.5	19.3
					21100	2535.0	19.3
					21425	2567.5	19.2
			12	6	20775	2502.5	19.1
					21100	2535.0	19.3
					21425	2567.5	19.2
			1	0	20775	2502.5	20.0
					21100	2535.0	20.0
					21425	2567.5	20.0
			1	24	20775	2502.5	20.0
					21100	2535.0	20.0
					21425	2567.5	19.9

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
7	QPSK	10 MHz	50	0	20800	2505.0	19.1
					21100	2535.0	19.2
					21400	2565.0	19.3
			25	12	20800	2505.0	19.2
					21100	2535.0	19.3
					21400	2565.0	19.4
			1	0	20800	2505.0	20.0
					21100	2535.0	20.0
					21400	2565.0	20.0
			1	24	20800	2505.0	20.0
					21100	2535.0	20.0
					21400	2565.0	20.0
		15 MHz	75	0	20825	2507.5	19.1
					21100	2535.0	19.2
					21375	2562.5	19.2
			36	19	20825	2507.5	19.2
					21100	2535.0	19.2
					21375	2562.5	19.2
			1	0	20825	2507.5	20.0
					21100	2535.0	20.0
					21375	2562.5	20.0
			1	74	20825	2507.5	20.0
					21100	2535.0	20.0
					21375	2562.5	20.0
		20 MHz	100	0	20850	2510.0	19.2
					21100	2535.0	19.2
					21350	2560.0	19.3
			50	25	20850	2510.0	19.1
					21100	2535.0	19.1
					21350	2560.0	19.3
			1	0	20850	2510.0	20.0
					21100	2535.0	20.0
					21350	2560.0	20.0
			1	99	20850	2510.0	20.0
					21100	2535.0	20.0
					21350	2560.0	20.0

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
7	16QAM	5 MHz	25	0	20775	2502.5	18.3
					21100	2535.0	18.2
					21425	2567.5	18.1
			12	6	20775	2502.5	18.3
					21100	2535.0	18.2
					21425	2567.5	18.4
			1	0	20775	2502.5	19.0
					21100	2535.0	19.0
					21425	2567.5	19.1
			1	24	20775	2502.5	19.0
					21100	2535.0	19.0
					21425	2567.5	19.1

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
7	16QAM	10 MHz	50	0	20800	2505.0	18.2
					21100	2535.0	18.1
					21400	2565.0	18.3
			25	12	20800	2505.0	18.3
					21100	2535.0	18.2
					21400	2565.0	18.4
			1	0	20800	2505.0	19.3
					21100	2535.0	19.2
					21400	2565.0	19.2
			1	24	20800	2505.0	19.3
					21100	2535.0	19.1
					21400	2565.0	19.2
		15 MHz	75	0	20825	2507.5	18.1
					21100	2535.0	18.0
					21375	2562.5	18.1
			36	19	20825	2507.5	18.3
					21100	2535.0	18.3
					21375	2562.5	18.2
			1	0	20825	2507.5	19.2
					21100	2535.0	19.3
					21375	2562.5	19.3
			1	74	20825	2507.5	19.1
					21100	2535.0	19.0
					21375	2562.5	19.2
		20 MHz	100	0	20850	2510.0	18.2
					21100	2535.0	18.1
					21350	2560.0	18.3
			50	25	20850	2510.0	18.1
					21100	2535.0	18.0
					21350	2560.0	18.2
			1	0	20850	2510.0	19.3
					21100	2535.0	19.4
					21350	2560.0	19.2
			1	99	20850	2510.0	19.1
					21100	2535.0	19.2
					21350	2560.0	19.2

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
41	QPSK	5 MHz	25	0	39675	2498.5	22.3
					40620	2593.0	22.3
					41565	2687.5	22.2
			12	6	39675	2498.5	22.1
					40620	2593.0	22.3
					41565	2687.5	22.2
			1	0	39675	2498.5	23.0
					40620	2593.0	23.0
					41565	2687.5	23.0
			1	24	39675	2498.5	23.0
					40620	2593.0	23.0
					41565	2687.5	22.9

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
41	QPSK	10 MHz	50	0	39700	2501.0	22.1
					40620	2593.0	22.2
					41540	2685.0	22.3
			25	12	39700	2501.0	22.2
					40620	2593.0	22.3
					41540	2685.0	22.4
			1	0	39700	2501.0	23.0
					40620	2593.0	23.0
					41540	2685.0	23.0
			1	24	39700	2501.0	23.0
					40620	2593.0	23.0
					41540	2685.0	23.0
		15 MHz	75	0	39725	2503.5	22.1
					40620	2593.0	22.2
					41515	2682.5	22.2
			36	19	39725	2503.5	22.2
					40620	2593.0	22.2
					41515	2682.5	22.2
			1	0	39725	2503.5	23.0
					40620	2593.0	23.0
					41515	2682.5	23.0
			1	74	39725	2503.5	23.0
					40620	2593.0	23.0
					41515	2682.5	23.0
		20 MHz	100	0	39750	2506.0	22.2
					40620	2593.0	22.2
					41490	2680.0	22.3
			50	25	39750	2506.0	22.1
					40620	2593.0	22.1
					41490	2680.0	22.3
			1	0	39750	2506.0	23.0
					40620	2593.0	23.0
					41490	2680.0	23.0
			1	99	39750	2506.0	23.0
					40620	2593.0	23.0
					41490	2680.0	23.0

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
41	16QAM	5 MHz	25	0	39675	2498.5	21.3
					40620	2593.0	21.2
					41565	2687.5	21.1
			12	6	39675	2498.5	21.3
					40620	2593.0	21.2
					41565	2687.5	21.4
			1	0	39675	2498.5	22.0
					40620	2593.0	22.0
					41565	2687.5	22.1
			1	24	39675	2498.5	22.0
					40620	2593.0	22.0
					41565	2687.5	22.1

Band	Modulation	Bandwidth	RB Size	RB Offset	Channel	Frequency	Power
41	16QAM	10 MHz	50	0	39700	2501.0	21.2
41	16QAM	10 MHz	50	0	40620	2593.0	21.1
41	16QAM	10 MHz	50	0	41540	2685.0	21.3
41	16QAM	10 MHz	25	12	39700	2501.0	21.3
41	16QAM	10 MHz	25	12	40620	2593.0	21.2
41	16QAM	10 MHz	25	12	41540	2685.0	21.4
41	16QAM	10 MHz	1	0	39700	2501.0	22.3
41	16QAM	10 MHz	1	0	40620	2593.0	22.2
41	16QAM	10 MHz	1	0	41540	2685.0	22.2
41	16QAM	10 MHz	1	24	39700	2501.0	22.3
41	16QAM	10 MHz	1	24	40620	2593.0	22.1
41	16QAM	10 MHz	1	24	41540	2685.0	22.2
41	16QAM	15 MHz	75	0	39725	2503.5	21.1
41	16QAM	15 MHz	75	0	40620	2593.0	21.0
41	16QAM	15 MHz	75	0	41515	2682.5	21.1
41	16QAM	15 MHz	36	19	39725	2503.5	21.3
41	16QAM	15 MHz	36	19	40620	2593.0	21.3
41	16QAM	15 MHz	36	19	41515	2682.5	21.2
41	16QAM	15 MHz	1	0	39725	2503.5	22.2
41	16QAM	15 MHz	1	0	40620	2593.0	22.3
41	16QAM	15 MHz	1	0	41515	2682.5	22.3
41	16QAM	15 MHz	1	74	39725	2503.5	22.1
41	16QAM	15 MHz	1	74	40620	2593.0	22.0
41	16QAM	15 MHz	1	74	41515	2682.5	22.2
41	16QAM	20 MHz	100	0	39750	2506.0	21.2
41	16QAM	20 MHz	100	0	40620	2593.0	21.1
41	16QAM	20 MHz	100	0	41490	2680.0	21.3
41	16QAM	20 MHz	50	25	39750	2506.0	21.1
41	16QAM	20 MHz	50	25	40620	2593.0	21.0
41	16QAM	20 MHz	50	25	41490	2680.0	21.2
41	16QAM	20 MHz	1	0	39750	2506.0	22.3
41	16QAM	20 MHz	1	0	40620	2593.0	22.4
41	16QAM	20 MHz	1	0	41490	2680.0	22.2
41	16QAM	20 MHz	1	99	39750	2506.0	22.1
41	16QAM	20 MHz	1	99	40620	2593.0	22.2
41	16QAM	20 MHz	1	99	41490	2680.0	22.2

SAR Data Summary –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	1	Top	782	23230	10 MHz/QPSK	1	24	0	23.48	1.15	1.30
	-----		782	23230	10 MHz/QPSK	25	12	1	23.51	0.973	1.09
	-----	Back	782	23230	10 MHz/QPSK	1	24	0	23.48	0.898	1.01
	-----		782	23230	10 MHz/QPSK	25	12	1	23.51	0.720	0.81
	-----	Left	782	23230	10 MHz/QPSK	1	24	0	23.48	0.0603	0.07
	-----		782	23230	10 MHz/QPSK	25	12	1	23.51	0.0462	0.05
	-----	Repeat	782	23230	10 MHz/QPSK	1	24	0	23.48	1.12	1.26

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 –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	-----	Top	704.0	23060	10 MHz/QPSK	1	24	0	22.9	0.964	1.24
	-----		707.5	23095	10 MHz/QPSK	1	24	0	23.0	0.976	1.23
	2		711.0	23129	10 MHz/QPSK	1	24	0	23.0	1.00	1.26
	-----		707.5	23095	10 MHz/QPSK	25	12	1	22.0	0.781	0.98
	-----	Back	704.0	23060	10 MHz/QPSK	1	24	0	22.9	0.836	1.08
	-----		707.5	23095	10 MHz/QPSK	1	24	0	23.0	0.872	1.10
	-----		711.0	23129	10 MHz/QPSK	1	24	0	23.0	0.884	1.11
	-----		707.5	23095	10 MHz/QPSK	25	12	1	22.0	0.675	0.85
	-----	Left	707.5	23095	10 MHz/QPSK	1	24	0	23.0	0.0678	0.09
	-----		707.5	23095	10 MHz/QPSK	25	12	1	22.0	0.0688	0.09
	-----	Repeat	707.5	23095	10 MHz/QPSK	1	24	0	23.0	0.989	1.25

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 – 850 MHz Body – UMTS Band 5

MEASUREMENT RESULTS									
Gap	**Plot**	**Frequency MHz**	**Frequency Ch.**	**Modulation**	**Position**	**End Power (dBm)**	**RMC**	**Test Set Up**	**Measured SAR (W/kg)**	**Reported SAR (W/kg)**
0 mm	3	826.4	4132	WCDMA	Top	22.89	12.2 kbps	Test Loop 1	1.02	1.32
	-----	836.6	4183			22.91	12.2 kbps	Test Loop 1	0.901	1.16
	-----	846.6	4233			22.87	12.2 kbps	Test Loop 1	0.875	1.14
	-----	836.6	4183		Back	22.91	12.2 kbps	Test Loop 1	0.726	0.93
	-----	836.6	4183		Left	22.91	12.2 kbps	Test Loop 1	0.0662	0.09
	-----	836.6	4183		Repeat	22.89	12.2 kbps	Test Loop 1	1.00	1.29

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 –LTE Band 26

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	4	Top	821.5	26740	15 MHz/QPSK	1	37	0	24.0	1.29	1.29
	-----		831.5	26865	15 MHz/QPSK	1	37	0	24.0	1.25	1.25
	-----		841.5	26990	15 MHz/QPSK	1	37	0	24.0	1.24	1.24
	-----		821.5	26740	15 MHz/QPSK	37	18	1	23.0	1.10	1.10
	-----		831.5	26865	15 MHz/QPSK	37	18	1	23.0	0.984	0.98
	-----		841.5	26990	15 MHz/QPSK	37	18	1	23.0	0.970	0.97
	-----	Back	821.5	26740	15 MHz/QPSK	1	37	0	24.0	0.975	0.98
	-----		831.5	26865	15 MHz/QPSK	1	37	0	24.0	0.906	0.91
	-----		841.5	26990	15 MHz/QPSK	1	37	0	24.0	0.875	0.88
	-----		831.5	26865	15 MHz/QPSK	37	18	1	23.0	0.716	0.72
	-----	Left	831.5	26865	15 MHz/QPSK	1	37	0	24.0	0.101	0.10
	-----		831.5	26865	15 MHz/QPSK	37	18	1	23.0	0.0735	0.07
	-----	Repeat	831.5	26865	15 MHz/QPSK	1	37	0	24.0	1.27	1.27

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 Body – UMTS Band 4

MEASUREMENT RESULTS										
Gap	Plot	Frequency		Modulation	Position	End Power	RMC	Test Set Up	Measured SAR (W/kg)	Reported SAR (W/kg)
		MHz	Ch.			(dBm)				
0 mm	-----	1712.4	1312	WCDMA	Top	22.88	12.2 kbps	Test Loop 1	0.521	0.67
	5	1732.6	1413			22.95	12.2 kbps	Test Loop 1	0.672	0.86
	-----	1752.6	1513			22.90	12.2 kbps	Test Loop 1	0.597	0.77
	-----	1732.6	1413		Back	22.95	12.2 kbps	Test Loop 1	0.623	0.79
	-----	1732.6	1413		Left	22.95	12.2 kbps	Test Loop 1	0.0593	0.08

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 –LTE Band 4

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	-----	Top	1732.5	20175	20 MHz/QPSK	1	49	0	22.0	0.503	0.80
	-----		1732.5	20175	20 MHz/QPSK	50	24	1	21.0	0.522	0.83
	-----	Back	1732.5	20175	20 MHz/QPSK	1	49	0	22.0	0.569	0.72
	-----		1720.0	20050	20 MHz/QPSK	50	24	1	21.0	0.523	0.83
	6		1732.5	20175	20 MHz/QPSK	50	24	1	21.0	0.607	0.96
	-----		1745.0	20300	20 MHz/QPSK	50	24	1	21.0	0.578	0.92
	-----	Left	1732.5	20175	20 MHz/QPSK	1	49	0	22.0	0.0493	0.08
	-----		1732.5	20175	20 MHz/QPSK	50	24	1	21.0	0.049	0.08

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 Body – UMTS Band 2

MEASUREMENT RESULTS										
Gap	**Plot**	**Frequency**		**Modulation**	**Position**	**End Power**	**RMC**	**Test Set Up**	**Measured SAR (W/kg)**	**Reported SAR (W/kg)**
		MHz	**Ch.**			**(dBm)**				
0 mm	-----	1880.0	9400	WCDMA	Top	22.86	12.2 kbps	Test Loop 1	0.544	0.71
	7	1852.4	9262		Back	22.83	12.2 kbps	Test Loop 1	0.960	1.26
	-----	1880.0	9400			22.86	12.2 kbps	Test Loop 1	0.900	1.17
	-----	1907.6	9538			22.81	12.2 kbps	Test Loop 1	0.923	1.21
	-----	1880.0	9400		Left	22.86	12.2 kbps	Test Loop 1	0.0548	0.07
	-----	1880.0	9400		Repeat	22.86	12.2 kbps	Test Loop 1	0.951	1.24

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 –LTE Band 25

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	-----	Top	1860.0	26140	20 MHz/QPSK	1	49	0	23.1	1.13	1.39
	8		1882.5	26365	20 MHz/QPSK	1	49	0	23.2	1.17	1.41
	-----		1905.0	26590	20 MHz/QPSK	1	49	0	23.0	1.06	1.33
	-----		1860.0	26140	20 MHz/QPSK	50	24	1	22.0	0.896	1.13
	-----		1882.5	26365	20 MHz/QPSK	50	24	1	22.4	0.922	1.06
	-----		1905.0	26590	20 MHz/QPSK	50	24	1	22.3	0.867	1.02
	-----	Back	1882.5	26365	20 MHz/QPSK	1	49	0	23.2	0.710	0.85
	-----		1882.5	26365	20 MHz/QPSK	50	24	1	22.4	0.705	0.81
	-----	Left	1882.5	26365	20 MHz/QPSK	1	49	0	23.2	0.0731	0.09
	-----		1882.5	26365	20 MHz/QPSK	50	24	1	22.4	0.0581	0.07
	-----	Repeat	1882.5	26365	20 MHz/QPSK	1	49	0	23.2	1.15	1.38

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 –LTE Band 30

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	-----	Top	2310	27710	10 MHz/QPSK	1	24	0	22.0	0.404	0.51
	-----		2310	27710	10 MHz/QPSK	25	12	1	21.0	0.406	0.51
	9	Back	2310	27710	10 MHz/QPSK	1	24	0	22.0	1.02	1.28
	-----		2310	27710	10 MHz/QPSK	25	12	1	21.0	1.02	1.28
	-----	Left	2310	27710	10 MHz/QPSK	1	24	0	22.0	0.00499	0.01
	-----		2310	27710	10 MHz/QPSK	25	12	1	21.0	0.00578	0.01
	-----	Repeat	2310	27710	10 MHz/QPSK	1	24	0	22.0	1.00	1.26
										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 –LTE Band 7

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	-----	Top	2535	21100	20 MHz/QPSK	1	49	0	20.0	0.275	0.55
	-----		2535	21100	20 MHz/QPSK	50	24	1	19.0	0.265	0.53
	-----	Back	2535	21100	20 MHz/QPSK	1	49	0	20.0	0.675	1.35
	-----		2510	20850	20 MHz/QPSK	50	24	1	19.0	0.702	1.40
	10		2535	21100	20 MHz/QPSK	50	24	1	19.0	0.706	1.41
	-----		2560	21350	20 MHz/QPSK	50	24	1	19.0	0.678	1.35
	-----	Left	2535	21100	20 MHz/QPSK	1	49	0	20.0	0.0166	0.03
	-----		2535	21100	20 MHz/QPSK	50	24	1	19.0	0.0181	0.04

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 –LTE Band 41

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	-----	Top	2593	40620	20 MHz/QPSK	1	49	0	23.0	0.258	0.26
	-----		2593	40620	20 MHz/QPSK	50	24	1	22.0	0.243	0.24
	-----	Back	2506	39750	20 MHz/QPSK	1	49	0	23.0	0.592	0.59
	-----		2549.5	40185	20 MHz/QPSK	1	49	0	23.0	0.604	0.60
	11		2593	40620	20 MHz/QPSK	1	49	0	23.0	0.695	0.70
	-----		2636.5	41055	20 MHz/QPSK	1	49	0	23.0	0.632	0.63
	-----		2680	41490	20 MHz/QPSK	1	49	0	23.0	0.611	0.61
	-----		2506	39750	20 MHz/QPSK	50	24	1	22.0	0.568	0.57
	-----		2549.5	40185	20 MHz/QPSK	50	24	1	22.0	0.592	0.59
	-----		2593	40620	20 MHz/QPSK	50	24	1	22.0	0.642	0.64
	-----		2636.5	41055	20 MHz/QPSK	50	24	1	22.0	0.602	0.60
	-----		2680	41490	20 MHz/QPSK	50	24	1	22.0	0.583	0.58
	-----	Left	2593	40620	20 MHz/QPSK	1	49	0	23.0	0.0158	0.02
	-----		2593	40620	20 MHz/QPSK	50	24	1	22.0	0.0173	0.02

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

LTE TDD testing is performed using the SAR test guidance provided in FCC KDB 941225 D05 v02r04. TDD is tested at the highest duty factor using UL-DL configuration 0 with special subframe configuration 6 and applying the FDD LTE procedures in KDB 941225 D05 v02r04. SAR testing is performed using the extended cyclic prefix listed in 3GPP TS 36.211 Section 4. A duty cycle of 1:1.58 is the highest duty cycle achievable which was used for testing Band 41.

SAR Data Summary – Simultaneous Evaluation

MEASUREMENT RESULTS - BT									
Frequency		Modulation	Frequency		Modulation	SAR_1	SAR_2	SAR Total
MHz	Ch.		MHz	Ch.				
2535	21100	LTE	2440	39	GFSK	1.41	0.15	1.56
5280	56	OFDM	2440	39	GFSK	1.09	0.15	1.24
					Body 1.6 W/kg (mW/g) averaged over 1 gram			

The highest measured SAR value was used to determine simultaneous evaluation. The BT SAR value was estimated based on KDB 447498 D01 v06 section 4.3.2 b) 1) page 14. The sum of the two transmitters is less than the limit for both combinations; therefore, the simultaneous transmission meets the requirements of KDB447498 D01 v06 section 4.3.2 page 11.

MEASUREMENT RESULTS – WWAN & WiFi and MIMO								
Frequency		Modulation	Frequency		Modulation	SAR_1	SAR_2 - WiFi	SAR Total
MHz	Ch.		MHz	Ch.				
2535	21100	LTE	5825	157	OFDM	1.41 (WWAN)	1.49 (Main)	2.90
2535	21100	LTE	5825	157	OFDM	1.41 (WWAN)	1.49 (Aux)	2.90
5280	56	OFDM	5620	124	OFDM	1.49 (Main)	1.49 (Aux)	2.98
					Body 1.6 W/kg (mW/g) averaged over 1 gram			

The WWAN and WiFi (Main) antennas are a minimum of 107 mm apart. The WWAN and WiFi (Aux) antennas are a minimum of 263 mm apart. The WiFi (Main) and WiFi (Aux) antennas are a minimum of 147 mm apart. Using the highest reported SAR and estimated SAR for WiFi based on KDB 447498 D01 V06 section 4.3.2 b) 1) page 14 to calculate the simultaneous Tx using peak separation ratio, the highest ratio would be 0.04 which meets the requirements of KDB 447498 section 4.3.2 3) on page 13. The calculation is shown below.

WiFi Estimated SAR Value

(max power,mW / min distance, mm) * $\sqrt{f_{(GHz)}}/x$; where x = 7.5
(39.8 mW / 8.6 mm) * √5.825/7.5 = 1.49 W/kg
(50.1 mW / 8.6 mm) * √2.462/7.5 = 1.22 W/kg

Simultaneous Separation Ratio Calculation

$(SAR_1 + SAR_2)^{1.5}/R_i \le 0.04$ rounded to two digits

$(1.41 + 1.49)^{1.5}/107 = 0.04$; WWAN to WiFi (Main)
$(1.41 + 1.49)^{1.5}/263 = 0.02$; WWAN to WiFi (Aux)
$(1.49 + 1.49)^{1.5}/147 = 0.04$; WiFi (Main) to WiFi (Aux)

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
ELI4 Flat Phantom	N/A	N/A	2037
Device Holder	N/A	N/A	N/A
Data Acquisition Electronics 4	02/09/2017	02/09/2016	1217
SPEAG E-Field Probe ES3DV3	02/16/2017	02/16/2016	3311
SPEAG E-Field Probe EX3DV4	04/27/2017	04/27/2016	3662
SPEAG E-Field Probe EX3DV4	01/27/2017	01/27/2016	3833
Speag Validation Dipole D750V2	08/10/2017	08/10/2015	1053
Speag Validation Dipole D835V2	08/10/2017	08/10/2015	4d131
Speag Validation Dipole D1750V2	08/13/2017	08/13/2015	1061
Speag Validation Dipole D1900V2	08/13/2017	08/13/2015	5d147
Speag Validation Dipole D2300V2	09/17/2017	09/17/2015	1060
Speag Validation Dipole D2550V2	08/10/2017	08/10/2015	1003
Speag Validation Dipole D2450V2	08/10/2017	08/10/2015	881
Speag Validation Dipole D5GHzV2	08/11/2017	08/11/2015	1119
Agilent N1911A Power Meter	05/20/2017	05/20/2015	GB45100254
Agilent N1922A Power Sensor	06/25/2017	06/25/2015	MY45240464
Advantest R3261A Spectrum Analyzer	03/26/2017	03/26/2015	31720068
Agilent (HP) 8350B Signal Generator	03/26/2017	03/26/2015	2749A10226
Agilent (HP) 83525A RF Plug-In	03/26/2017	03/26/2015	2647A01172
Agilent (HP) 8753C Vector Network Analyzer	03/26/2017	03/26/2015	3135A01724
Agilent (HP) 85047A S-Parameter Test Set	03/26/2017	03/26/2015	2904A00595
Agilent (HP) 8960 Base Station Sim.	03/31/2017	03/31/2015	MY48360364
Anritsu MT8820C	07/28/2017	07/28/2015	6201176199
Agilent 778D Dual Directional Coupler	N/A	N/A	MY48220184
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
Body Equivalent Matter (750 MHz)	N/A	N/A	N/A
Body Equivalent Matter (835/900 MHz)	N/A	N/A	N/A
Body Equivalent Matter (1750 MHz)	N/A	N/A	N/A
Body Equivalent Matter (1900 MHz)	N/A	N/A	N/A
Body Equivalent Matter (2300 MHz)	N/A	N/A	N/A
Body Equivalent Matter (2450 MHz)	N/A	N/A	N/A
Body Equivalent Matter (2600 MHz)	N/A	N/A	N/A
Body Equivalent Matter (5 GHz)	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.

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 – 2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave, New York: IEEE, 2002.

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

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

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

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

Appendix A – System Validation Plots and Data

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**********************************************************
Test Result for UIM Dielectric Parameter
Mon 15/Aug/2016
Freq   Frequency(GHz)
FCC_eH Limits for Head Epsilon
FCC_sH Limits for Head Sigma
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon  of  UIM
Test_s Sigma of UIM
**********************************************************
```

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.7000	55.73	0.96	55.72	0.97
0.7040	55.714	0.96	55.708	0.974*
0.7075	55.70	0.96	55.698	0.978*
0.7100	55.69	0.96	55.69	0.98
0.7110	55.686	0.96	55.687	0.98*
0.7200	55.65	0.96	55.66	0.98
0.7300	55.61	0.96	55.63	0.98
0.7400	55.57	0.96	55.60	0.99
0.7500	55.53	0.96	55.57	0.99
0.7600	55.49	0.96	55.54	0.99
0.7700	55.45	0.96	55.50	1.00
0.7800	55.41	0.97	55.46	1.00
0.7820	55.404	0.97	55.452	1.00*
0.7900	55.38	0.97	55.42	1.00
0.8000	55.34	0.97	55.38	1.01

* value interpolated

```
**********************************************************
Test Result for UIM Dielectric Parameter
Mon 22/Aug/2016
Freq   Frequency(GHz)
FCC_eH Limits for Head Epsilon
FCC_sH Limits for Head Sigma
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon  of  UIM
Test_s Sigma of UIM
**********************************************************
```

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.8050	55.32	0.97	56.05	0.96
0.8150	55.28	0.97	56.00	0.98
0.8190	55.264	0.97	55.98	0.98*
0.8250	55.24	0.97	55.95	0.98
0.8264	55.234	0.97	55.944	0.981*
0.8315	55.214	0.97	55.924	0.987*
0.8350	55.20	0.97	55.91	0.99
0.8366	55.195	0.972	55.902	0.99*
0.8440	55.173	0.979	55.865	0.99*
0.8450	55.17	0.98	55.86	0.99
0.8466	55.165	0.982	55.857	0.992*
0.8550	55.14	0.99	55.84	1.00
0.8650	55.11	1.01	55.80	1.01
0.8750	55.08	1.02	55.78	1.03
0.8850	55.05	1.03	55.73	1.03
0.8950	55.02	1.04	55.70	1.04

* value interpolated

```
**********************************************************
Test Result for UIM Dielectric Parameter
Mon 22/Aug/2016
Freq   Frequency(GHz)
FCC_eH Limits for Head Epsilon
FCC_sH Limits for Head Sigma
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon  of  UIM
Test_s Sigma of UIM
**********************************************************
Freq          FCC_eB FCC_sB Test_e Test_s
1.7100        53.53  1.47   53.55  1.48
1.7124        53.525 1.47   53.543 1.482*
1.7200        53.51  1.47   53.52  1.49
1.7300        53.48  1.48   53.38  1.50
1.7325        53.475 1.48   53.375 1.503*
1.7326        53.475 1.48   53.375 1.503*
1.7400        53.46  1.48   53.36  1.51
1.7450        53.445 1.485  53.34  1.515*
1.7500        53.43  1.49   53.32  1.52
1.7526        53.425 1.49   53.315 1.523*
1.7600        53.41  1.49   53.30  1.53
1.7700        53.38  1.50   53.27  1.55
1.7800        53.35  1.51   53.23  1.55
* value interpolated
```

```
**********************************************************
Test Result for UIM Dielectric Parameter
Wed 17/Aug/2016
Freq   Frequency(GHz)
FCC_eH Limits for Head Epsilon
FCC_sH Limits for Head Sigma
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon  of  UIM
Test_s Sigma of UIM
**********************************************************
Freq          FCC_eB FCC_sB Test_e Test_s
1.8400        53.30  1.52   52.04  1.43
1.8500        53.30  1.52   52.03  1.44
1.8524        53.30  1.52   52.03  1.44*
1.8600        53.30  1.52   52.03  1.44
1.8700        53.30  1.52   52.14  1.45
1.8800        53.30  1.52   52.10  1.45
1.8825        53.30  1.52   52.118 1.453*
1.8900        53.30  1.52   52.17  1.46
1.9000        53.30  1.52   52.07  1.47
1.9076        53.30  1.52   52.108 1.493*
1.9050        53.30  1.52   52.095 1.485*
1.9100        53.30  1.52   52.12  1.50
1.9200        53.30  1.52   52.00  1.50
* value interpolated
```

```
************************************************************
Test Result for UIM Dielectric Parameter
Fri 19/Aug/2016
Freq   Frequency(GHz)
FCC_eH Limits for Head Epsilon
FCC_sH Limits for Head Sigma
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon  of  UIM
Test_s Sigma of UIM
************************************************************
```

Freq	FCC_eB	FCC_sB	Test_e	Test_s
2.2900	52.91	1.80	52.65	1.83
2.3000	52.90	1.81	52.63	1.84
2.3100	52.89	1.82	52.61	1.85
2.3200	52.87	1.83	52.59	1.86
2.3300	52.86	1.84	52.58	1.87
2.3400	52.85	1.84	52.56	1.88
2.3500	52.83	1.85	52.54	1.89

```
************************************************************
Test Result for UIM Dielectric Parameter
Fri 19/Aug/2016
Freq   Frequency(GHz)
FCC_eH Limits for Head Epsilon
FCC_sH Limits for Head Sigma
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon  of  UIM
Test_s Sigma of UIM
************************************************************
```

Freq	FCC_eB	FCC_sB	Test_e	Test_s
2.4900	52.65	2.01	52.60	2.02
2.5000	52.64	2.02	52.58	2.03
2.5060	52.628	2.032	52.562	2.042*
2.5100	52.62	2.04	52.55	2.05
2.5200	52.61	2.05	52.52	2.07
2.5300	52.60	2.06	52.50	2.09
2.5350	52.595	2.07	52.495	2.10*
2.5400	52.59	2.08	52.49	2.11
2.5500	52.57	2.09	52.47	2.12
2.5600	52.56	2.11	52.45	2.14
2.5700	52.55	2.12	52.43	2.16
2.5800	52.53	2.13	52.42	2.17
2.5900	52.52	2.15	52.39	2.19
2.5930	52.517	2.153	52.387	2.196*
2.6000	52.51	2.16	52.38	2.21
2.6100	52.50	2.18	52.35	2.22
2.6200	52.48	2.19	52.33	2.25
2.6300	52.47	2.21	52.32	2.27
2.6400	52.46	2.22	52.30	2.29
2.6500	52.45	2.23	52.29	2.30
2.6600	52.43	2.25	52.27	2.32
2.6700	52.42	2.26	52.25	2.34
2.6800	52.41	2.28	52.23	2.35
2.6900	52.39	2.29	52.20	2.37
2.7000	52.38	2.30	52.19	2.39

* value interpolated

```
************************************************************
Test Result for UIM Dielectric Parameter
Mon 21/Nov/2016
Freq   Frequency(GHz)
FCC_eH Limits for Head Epsilon
FCC_sH Limits for Head Sigma
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon  of  UIM
Test_s Sigma of UIM
************************************************************
```

Freq	FCC_eB	FCC_sB	Test_e	Test_s
2.4900	52.65	2.01	52.50	2.00
2.5000	52.64	2.02	52.48	2.01
2.5060	52.628	2.032	52.462	2.016*
2.5100	52.62	2.04	52.45	2.02
2.5200	52.61	2.05	52.43	2.04
2.5300	52.60	2.06	52.41	2.05
2.5400	52.59	2.08	52.39	2.06
2.5495	52.571	2.09	52.362	2.079*
2.5500	52.57	2.09	52.36	2.08
2.5600	52.56	2.11	52.33	2.10
2.5700	52.55	2.12	52.31	2.11
2.5800	52.53	2.13	52.29	2.12
2.5900	52.52	2.15	52.26	2.14
2.5930	52.517	2.153	52.251	2.143*
2.6000	52.51	2.16	52.23	2.15
2.6100	52.50	2.18	52.21	2.16
2.6200	52.48	2.19	52.19	2.17
2.6300	52.47	2.21	52.16	2.19
2.6365	52.464	2.217	52.147	2.203*
2.6400	52.46	2.22	52.14	2.21
2.6500	52.45	2.23	52.12	2.22
2.6600	52.43	2.25	52.10	2.23
2.6700	52.42	2.26	52.07	2.24
2.6800	52.41	2.28	52.05	2.25
2.6900	52.39	2.29	52.03	2.27
2.7000	52.38	2.30	52.01	2.29

* value interpolated

****
Test Result for UIM Dielectric Parameter
Tue 29/Nov/2016
Freq Frequency(GHz)
FCC_eH Limits for Head Epsilon
FCC_sH Limits for Head Sigma
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM
****

Freq	FCC_eB	FCC_sB	Test_e	Test_s
1.7100	53.54	1.46	52.81	1.53
1.7124	53.533	1.462	52.803	1.532*
1.7200	53.51	1.47	52.78	1.54
1.7300	53.48	1.48	52.74	1.55
1.7325	53.475	1.48	52.73	1.55*
1.7326	53.475	1.48	52.73	1.55*
1.7400	53.46	1.48	52.70	1.55
1.7450	53.445	1.485	52.69	1.555*
1.7500	53.43	1.49	52.68	1.56
1.7526	53.425	1.49	52.675	1.56*
1.7600	53.41	1.49	52.66	1.56
1.7700	53.38	1.50	52.65	1.57
1.7800	53.35	1.51	52.61	1.58
1.7900	53.33	1.51	52.58	1.59

* value interpolated

****
Test Result for UIM Dielectric Parameter
Tue 29/Nov/2016
Freq Frequency(GHz)
FCC_eH Limits for Head Epsilon
FCC_sH Limits for Head Sigma
FCC_eB Limits for Body Epsilon
FCC_sB Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM
****

Freq	FCC_eB	FCC_sB	Test_e	Test_s
2.5000	52.64	2.02	52.39	2.03
2.5100	52.62	2.04	52.37	2.04
2.5200	52.61	2.05	52.35	2.05
2.5300	52.60	2.06	52.33	2.07
2.5350	52.595	2.07	52.325	2.08*
2.5400	52.59	2.08	52.32	2.09
2.5500	52.57	2.09	52.30	2.10
2.5600	52.56	2.11	52.28	2.12
2.5700	52.55	2.12	52.26	2.14
2.5800	52.53	2.13	52.25	2.15
2.5900	52.52	2.15	52.22	2.17
2.6000	52.51	2.16	52.21	2.18
2.6100	52.50	2.18	52.19	2.19

* value interpolated

RF Exposure Lab

Plot 1

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

Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: MSL750; Medium parameters used: f = 750 MHz; σ = 0.99 S/m; ε_r = 55.57; ρ = 1000 kg/m^3
Phantom section: Flat Section

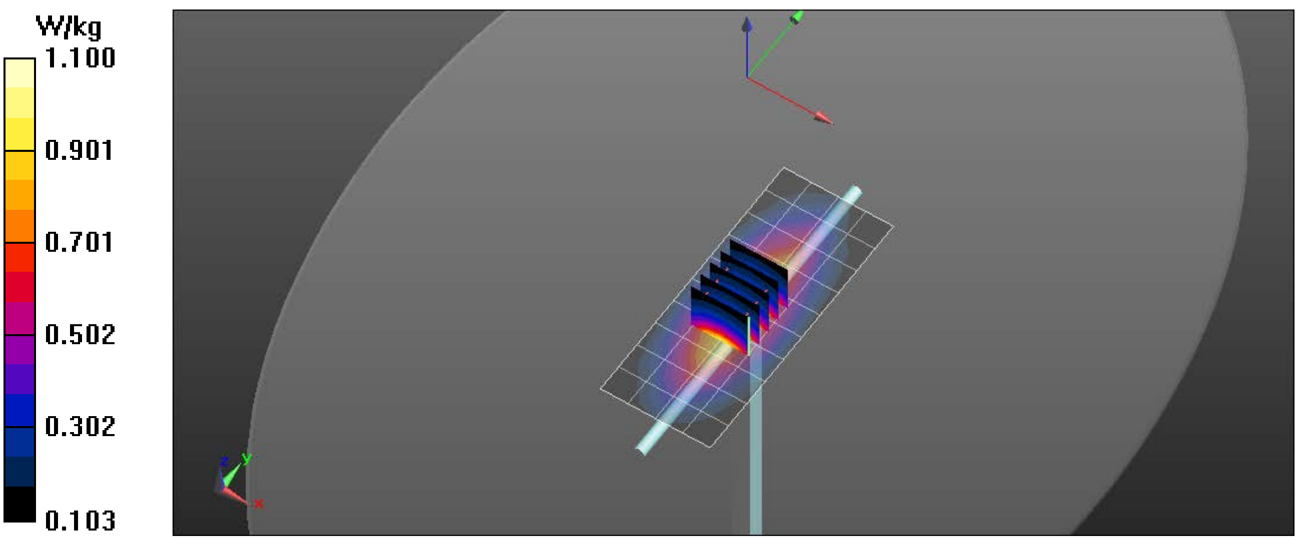
Test Date: Date: 8/15/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C

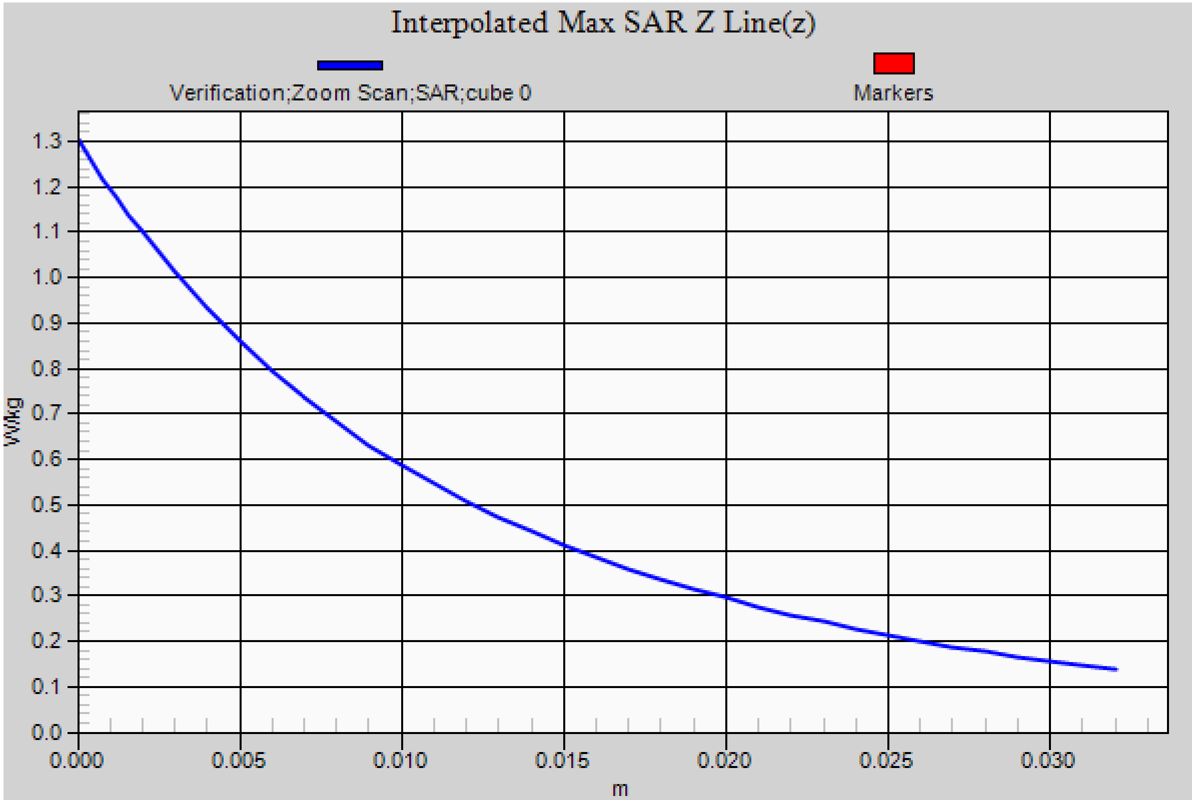
Probe: EX3DV4 - SN3662; ConvF(9.43, 9.43, 9.43); Calibrated: 4/27/2016;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Procedure Notes:

750 MHz/Verification/Area Scan (5x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.08 W/kg

750 MHz/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 31.227 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.30 W/kg
SAR(1 g) = 0.865 W/kg; SAR(10 g) = 0.569 W/kg
Maximum value of SAR (measured) = 1.10 W/kg




Interpolated Max SAR Z Line(z)
Verification;Zoom Scan;SAR;cube 0
Markers
W/kg
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

RF Exposure Lab

Plot 2

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:4d131

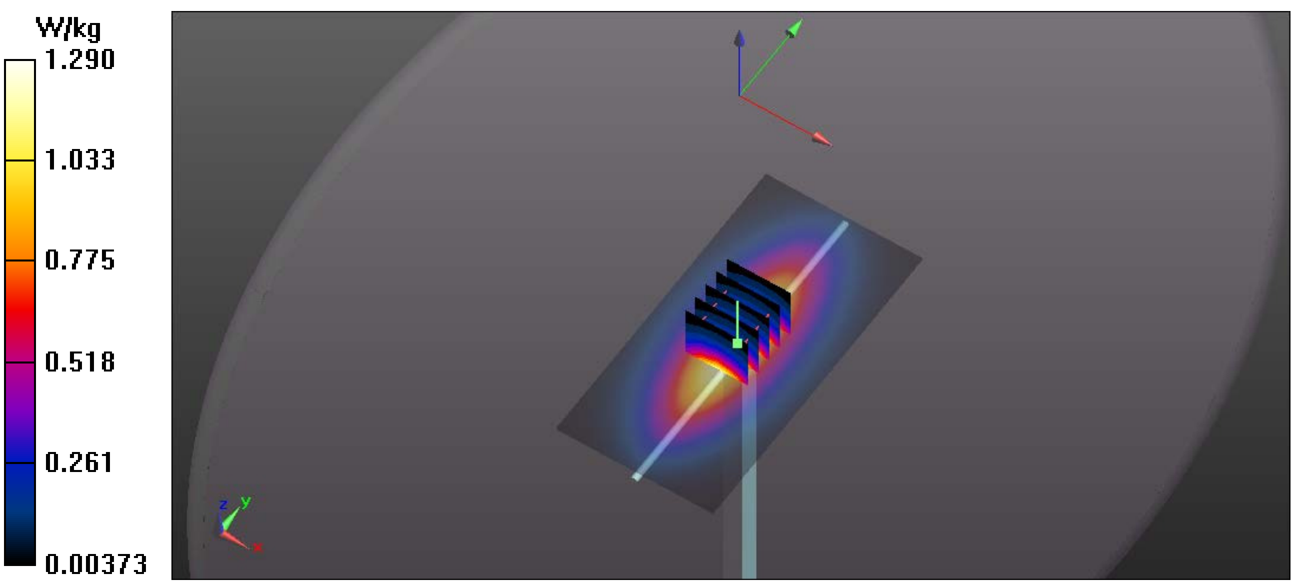
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: MSL835; Medium parameters used: f = 835 MHz; σ = 0.99 S/m; ε_r = 55.91; ρ = 1000 kg/m^3
Phantom section: Flat Section

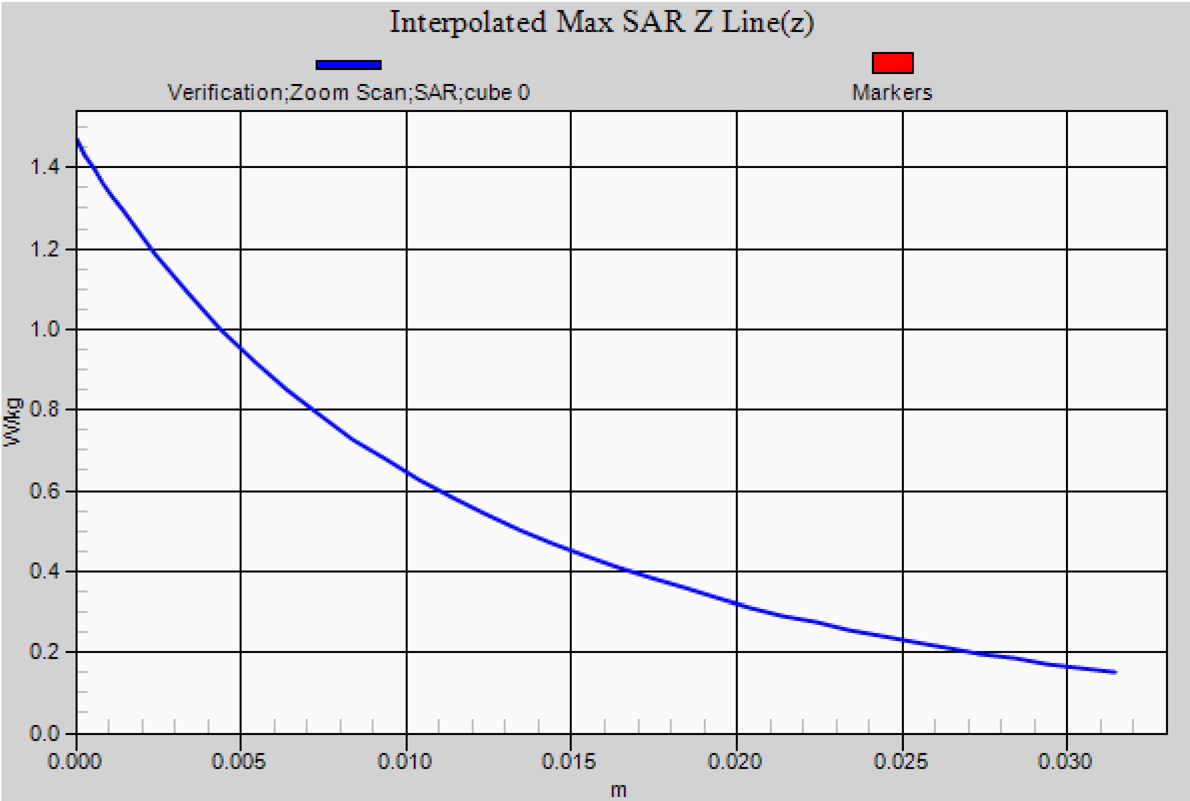
Test Date: Date: 8/22/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: ES3DV3 - SN3311; ConvF(6.33, 6.33, 6.33); Calibrated: 2/16/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Procedure Notes:

835 MHz Body/Verification/Area Scan (81x161x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.29 W/kg

835 MHz Body/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 52.612 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.47 W/kg
SAR(1 g) = 0.953 W/kg; SAR(10 g) = 0.632 W/kg
Maximum value of SAR (measured) = 1.29 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:1061

Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: MSL1750; Medium parameters used: f = 1750 MHz; σ = 1.52 S/m; ε_r = 53.32; ρ = 1000 kg/m^3
Phantom section: Flat Section

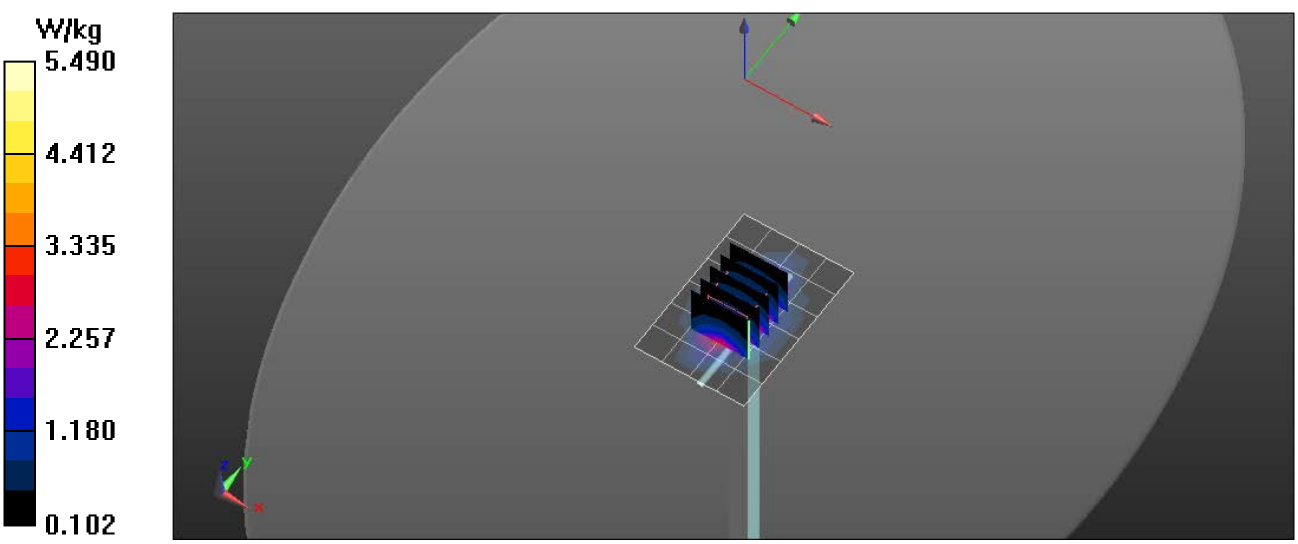
Test Date: Date: 8/22/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C

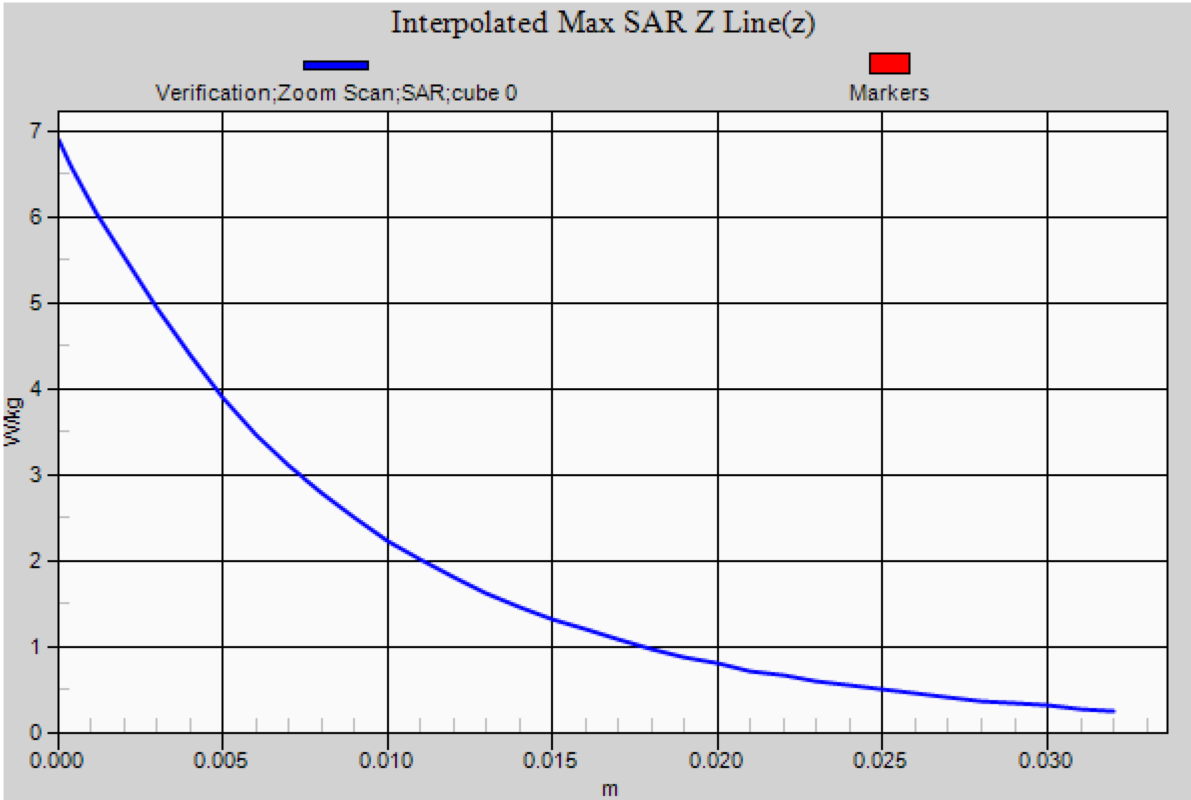
Probe: EX3DV4 - SN3833; ConvF(7.32, 7.32, 7.32); Calibrated: 1/27/2016;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Procedure Notes:

1750 MHz/Verification/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.33 W/kg

1750 MHz/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 31.227 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 6.89 W/kg
SAR(1 g) = 3.85 W/kg; SAR(10 g) = 2.03 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:5d147

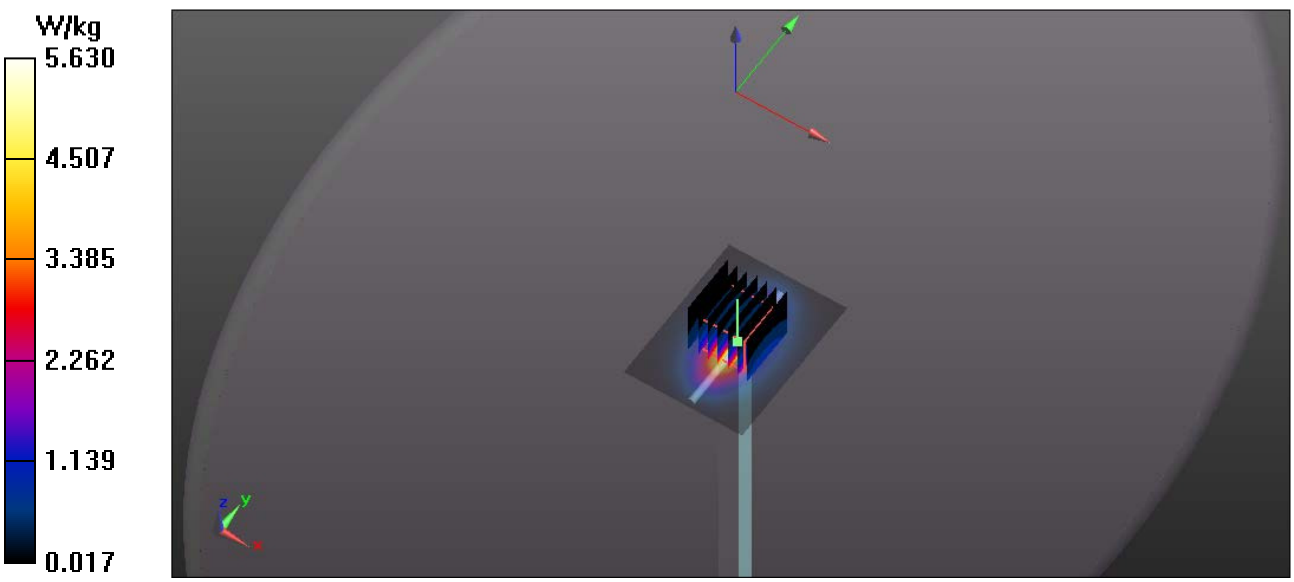
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: MSL1900; Medium parameters used: f = 1900 MHz; σ = 1.47 S/m; ε_r = 52.07; ρ = 1000 kg/m^3
Phantom section: Flat Section

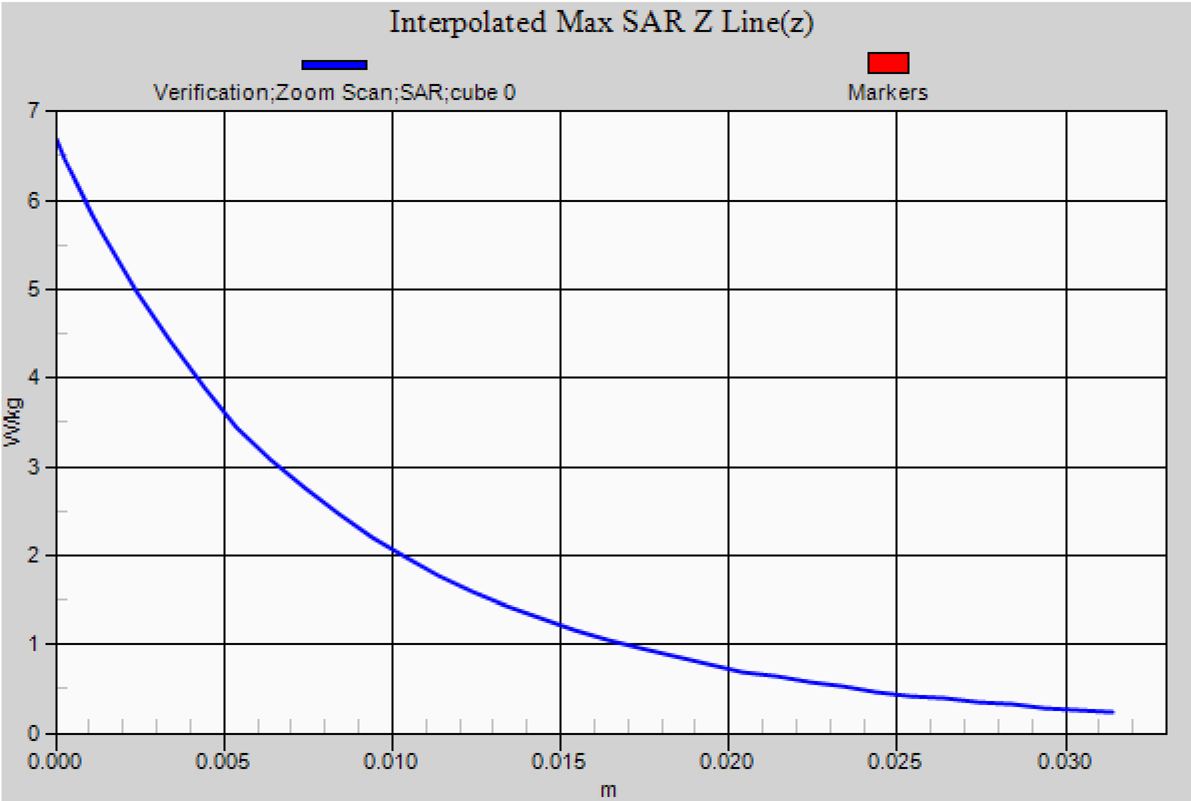
Test Date: Date: 8/17/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3662; ConvF(7.49, 7.49, 7.49); Calibrated: 4/27/2016;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Procedure Notes:

1900 MHz Body/Verification/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 5.63 W/kg

1900 MHz Body/Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.612 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 6.68 W/kg
SAR(1 g) = 3.98 W/kg; SAR(10 g) = 1.92 W/kg
Maximum value of SAR (measured) = 5.63 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 2300 MHz D2300V2; Type: D2300V2; Serial: D2300V2 - SN:1060

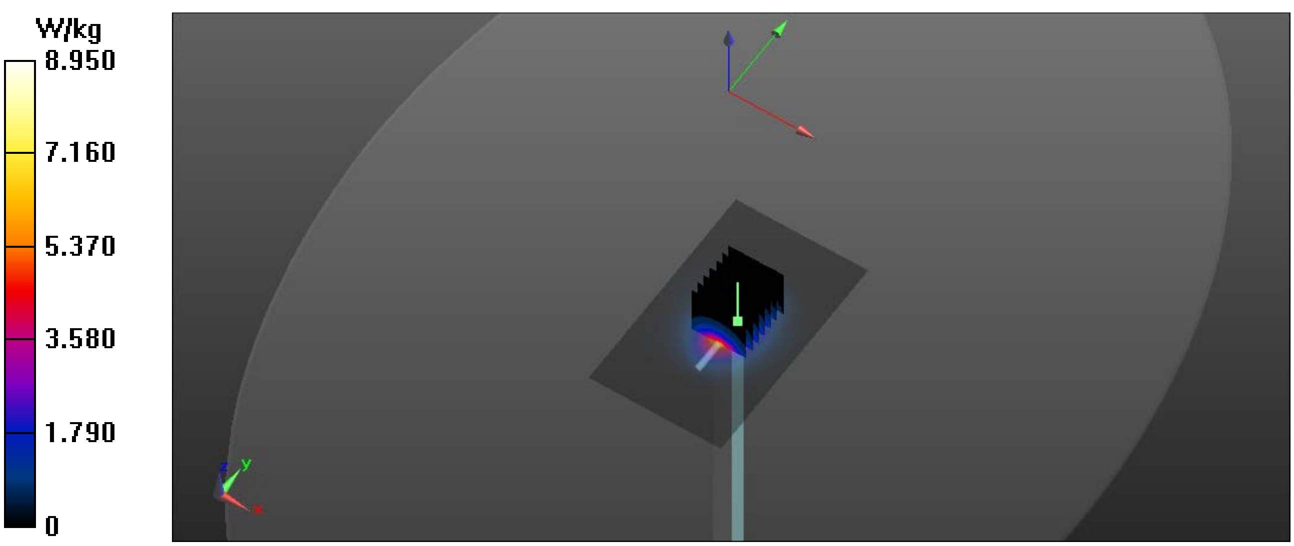
Communication System: CW; Frequency: 2300 MHz; Duty Cycle: 1:1
Medium: MSL2300; Medium parameters used: f = 2300 MHz; σ = 1.84 S/m; ε_r = 52.63; ρ = 1000 kg/m^3
Phantom section: Flat Section

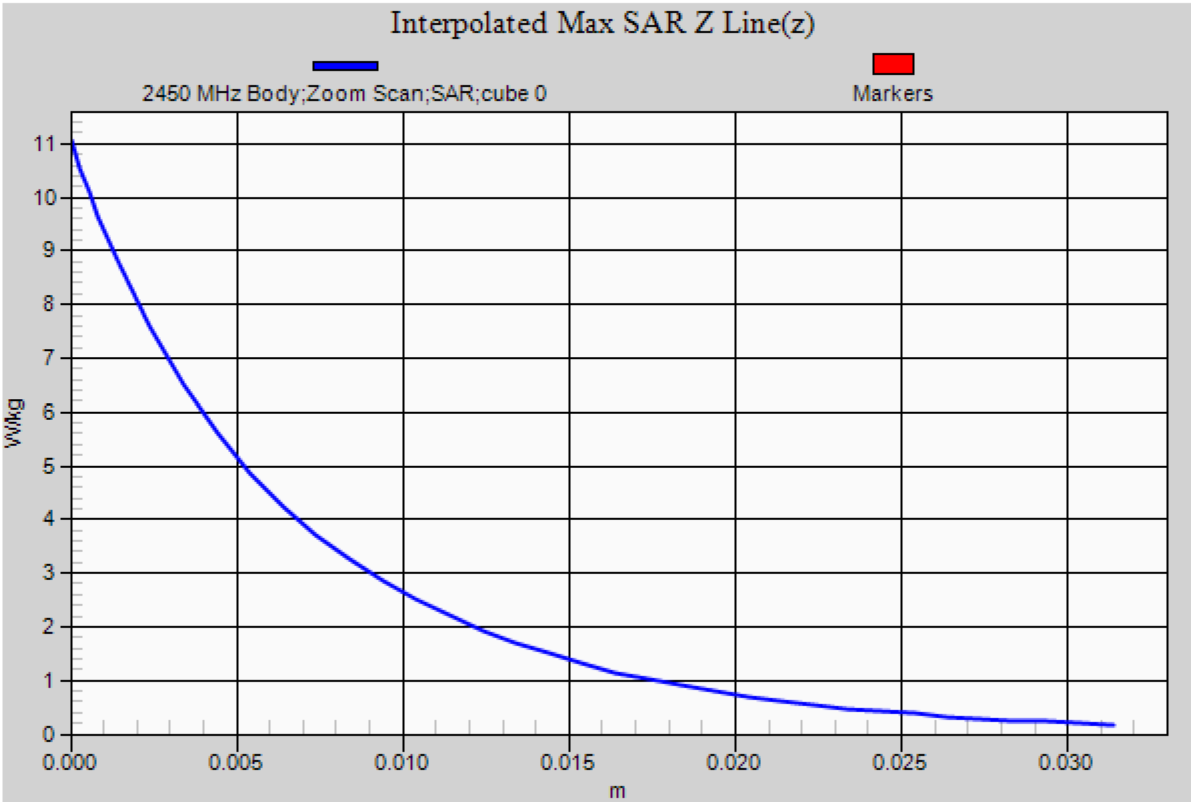
Test Date: Date: 8/19/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: ES3DV3 - SN3311; ConvF(4.69, 4.69, 4.69); Calibrated: 2/16/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Procedure Notes:

Body Verification/2300 MHz/Area Scan (61x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 8.95 W/kg

Body Verification/2300 MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.597 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 11.18 W/kg
P_{in}= 100 mW
SAR(1 g) = 4.82 W/kg; SAR(10 g) = 2.2 W/kg
Maximum value of SAR (measured) = 8.71 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

RF Exposure Lab

Plot 6

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

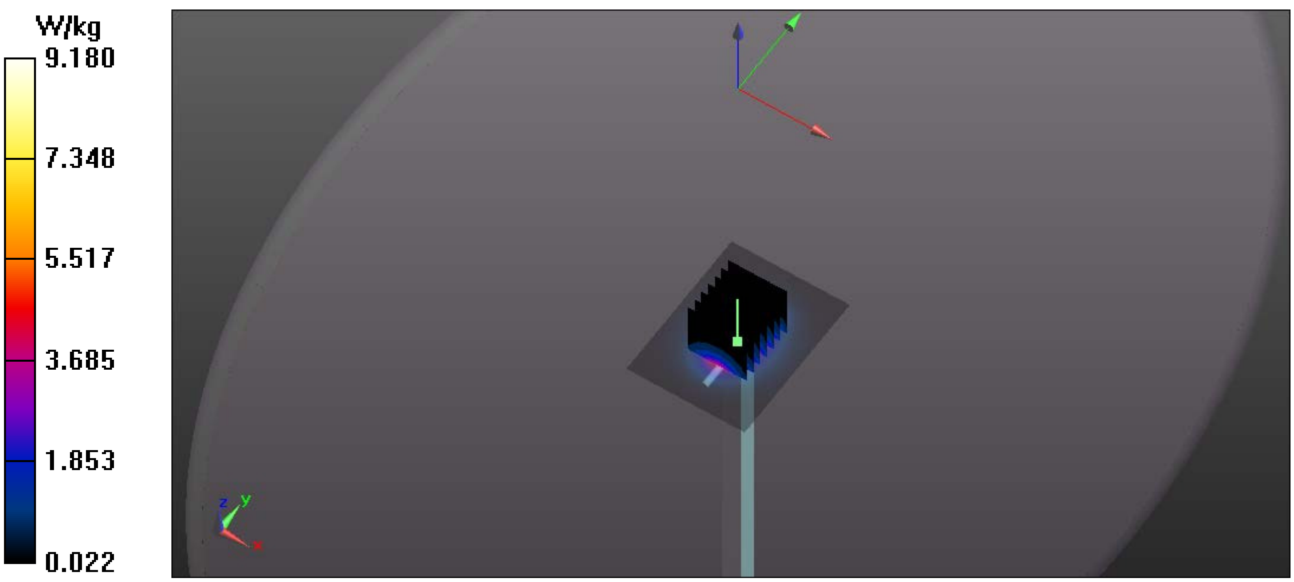
Communication System: CW; Frequency: 2550 MHz; Duty Cycle: 1:1
Medium: MSL2600; Medium parameters used: f = 2550 MHz; σ = 2.12 S/m; ε_r = 52.47; ρ = 1000 kg/m^3
Phantom section: Flat Section

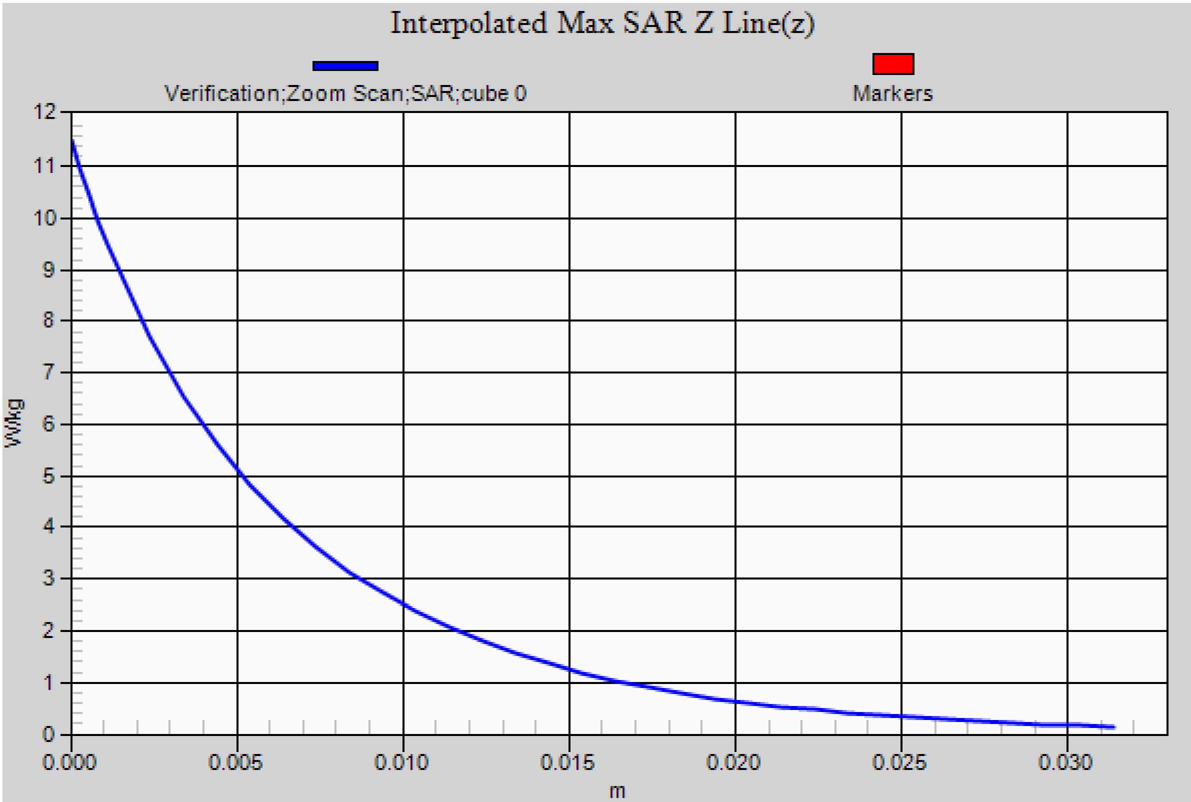
Test Date: Date: 8/19/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: ES3DV3 - SN3311; ConvF(4.17, 4.17, 4.17); Calibrated: 2/16/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Procedure Notes:

2550 MHz Body/Verification/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 9.18 W/kg

2550 MHz Body/Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.541 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 11.5 W/kg
SAR(1 g) = 5.41 W/kg; SAR(10 g) = 2.42 W/kg
Maximum value of SAR (measured) = 8.98 W/kg




Interpolated Max SAR Z Line(z)
Verification;Zoom Scan;SAR;cube 0
Markers
W/kg
m
12
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

RF Exposure Lab

Plot 7

DUT: Dipole 2550 MHz D2450V2; Type: D2550V2; Serial: D2550V2 - SN: 1003

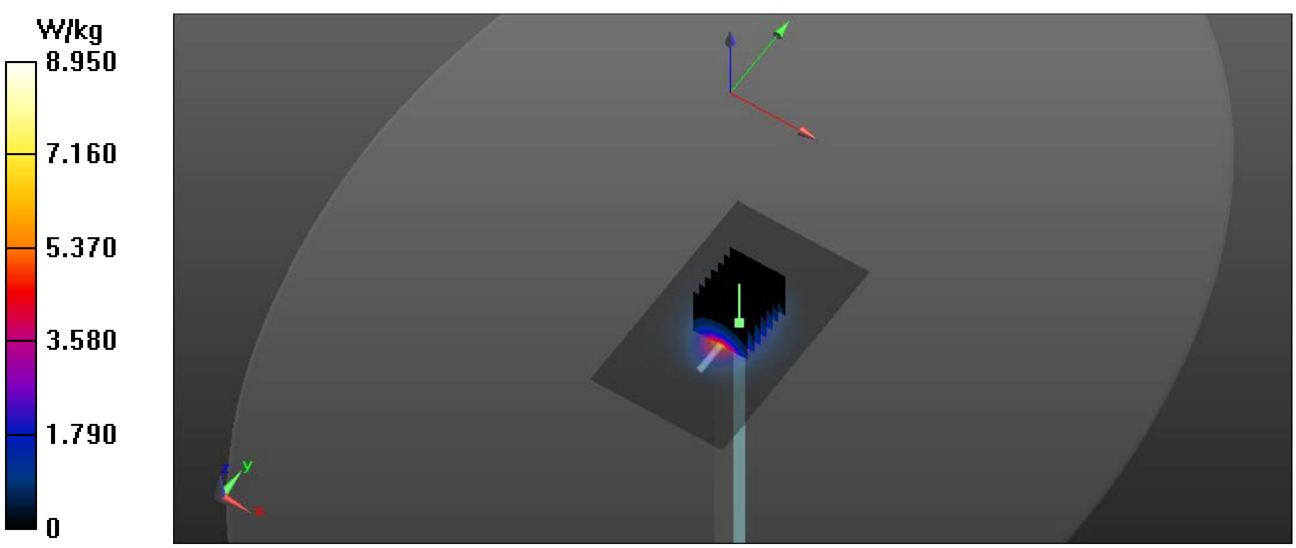
Communication System: CW; Frequency: 2550 MHz; Duty Cycle: 1:1
Medium: MSL2450; Medium parameters used: f = 2550 MHz; σ = 2.08 S/m; ε_r = 52.36; ρ = 1000 kg/m^3
Phantom section: Flat Section

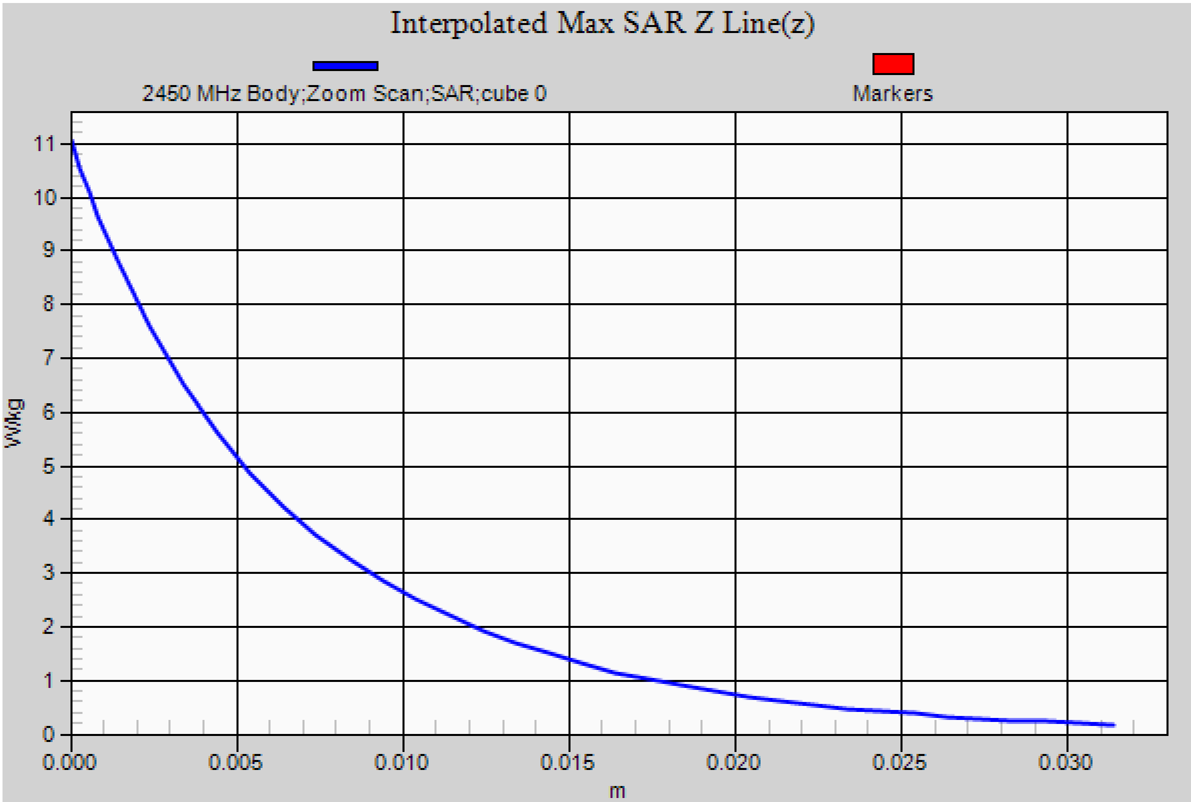
Test Date: Date: 11/21/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: ES3DV3 - SN3311; ConvF(4.17, 4.17, 4.17); Calibrated: 2/16/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Procedure Notes:

Body Verification/2450 MHz/Area Scan (61x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 8.95 W/kg

Body Verification/2450 MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.597 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 11.18 W/kg
P_{in}= 100 mW
SAR(1 g) = 5.22 W/kg; SAR(10 g) = 2.4 W/kg
Maximum value of SAR (measured) = 8.71 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

RF Exposure Lab

Plot 8

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

Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: MSL1750; Medium parameters used: f = 1750 MHz; σ = 1.56 S/m; ε_r = 52.68; ρ = 1000 kg/m^3
Phantom section: Flat Section

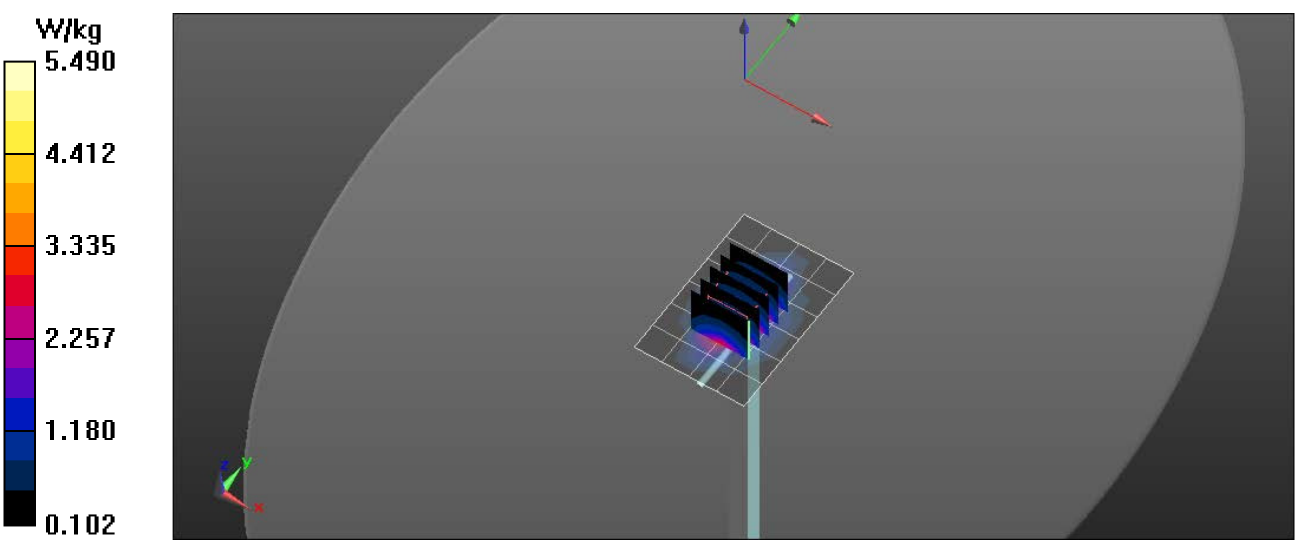
Test Date: Date: 11/29/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C

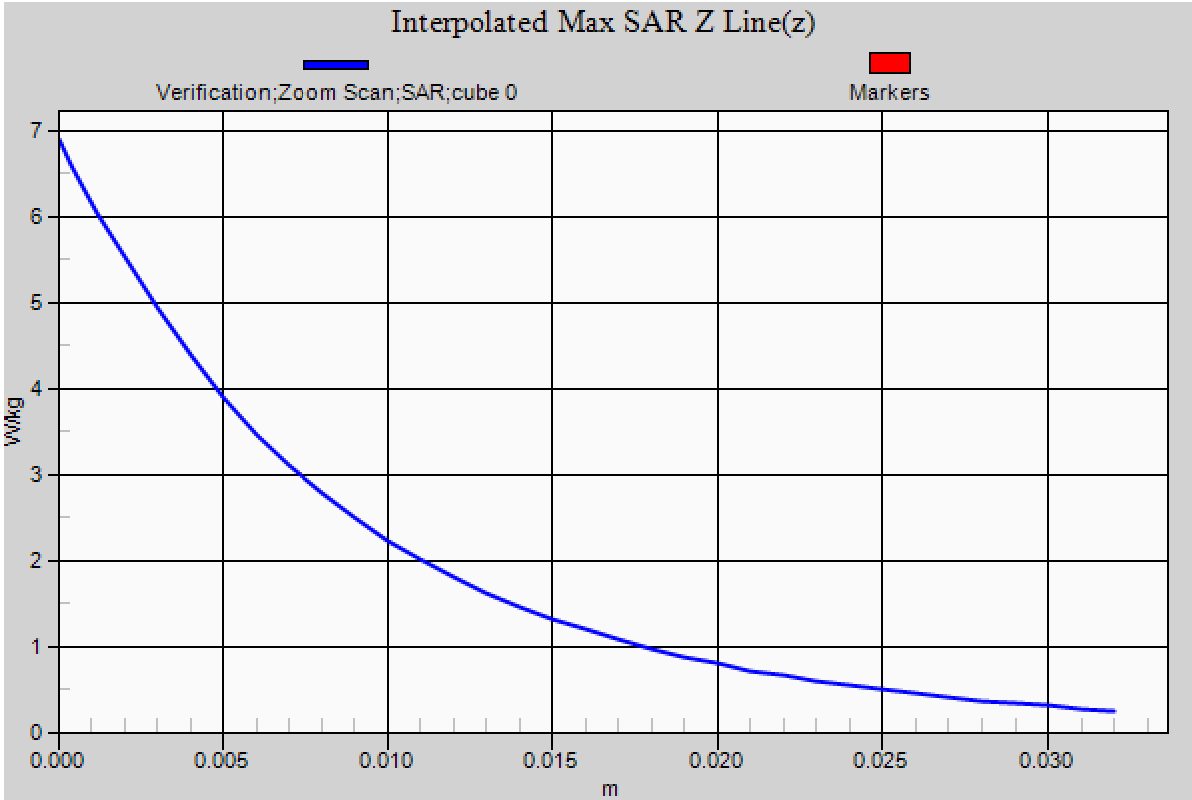
Probe: EX3DV4 - SN3833; ConvF(7.32, 7.32, 7.32); Calibrated: 1/27/2016;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Procedure Notes:

1750 MHz/Verification/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.26 W/kg

1750 MHz/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.426 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 6.87 W/kg
SAR(1 g) = 3.82 W/kg; SAR(10 g) = 2.01 W/kg
Maximum value of SAR (measured) = 5.48 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 9

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

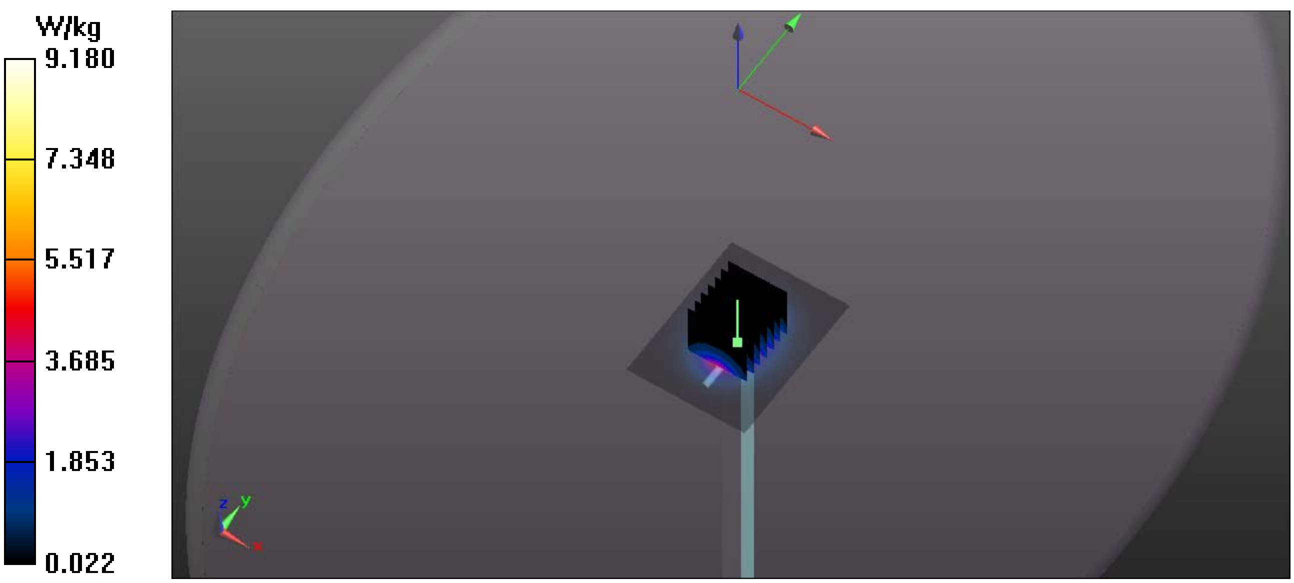
Communication System: CW; Frequency: 2550 MHz; Duty Cycle: 1:1
Medium: MSL2600; Medium parameters used: f = 2550 MHz; σ = 2.1 S/m; ε_r = 52.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

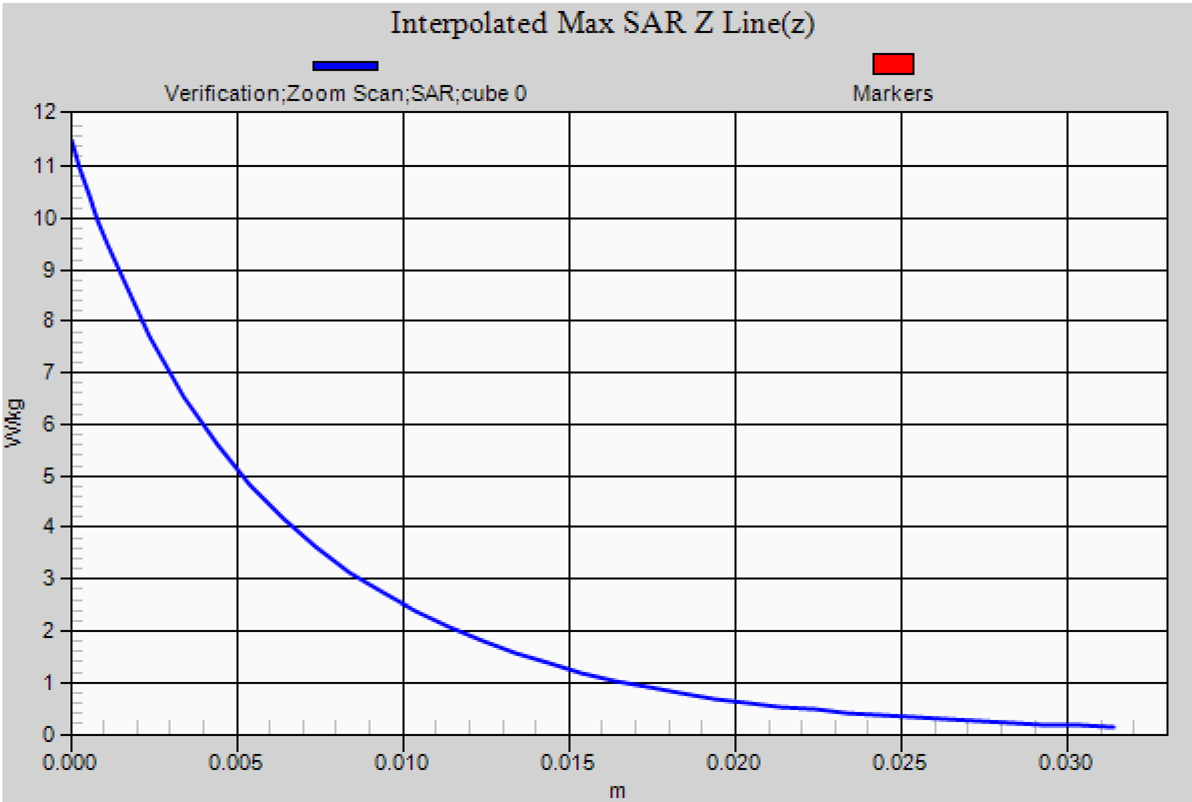
Test Date: Date: 11/29/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: ES3DV3 - SN3311; ConvF(4.17, 4.17, 4.17); Calibrated: 2/16/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Procedure Notes:

2550 MHz Body/Verification/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 9.15 W/kg

2550 MHz Body/Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.687 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 11.3 W/kg
SAR(1 g) = 5.35 W/kg; SAR(10 g) = 2.56 W/kg
Maximum value of SAR (measured) = 9.05 W/kg




Interpolated Max SAR Z Line(z)
Verification;Zoom Scan;SAR;cube 0
Markers
W/kg
m
12
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

Appendix B – SAR Test Data Plots

RF Exposure Lab

Plot 1

DUT: iX125R1; Type: Ruggedize Tablet; Serial: 65JKG00024

Communication System: LTE (SC-FDMA, 1 RB, 10 MHz, QPSK); Frequency: 782 MHz; Duty Cycle: 1:1
Medium: MSL750; Medium parameters used (interpolated): f = 782 MHz; σ = 1 S/m; ε_r = 55.452; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 8/16/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(9.43, 9.43, 9.43); Calibrated: 4/27/2016;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

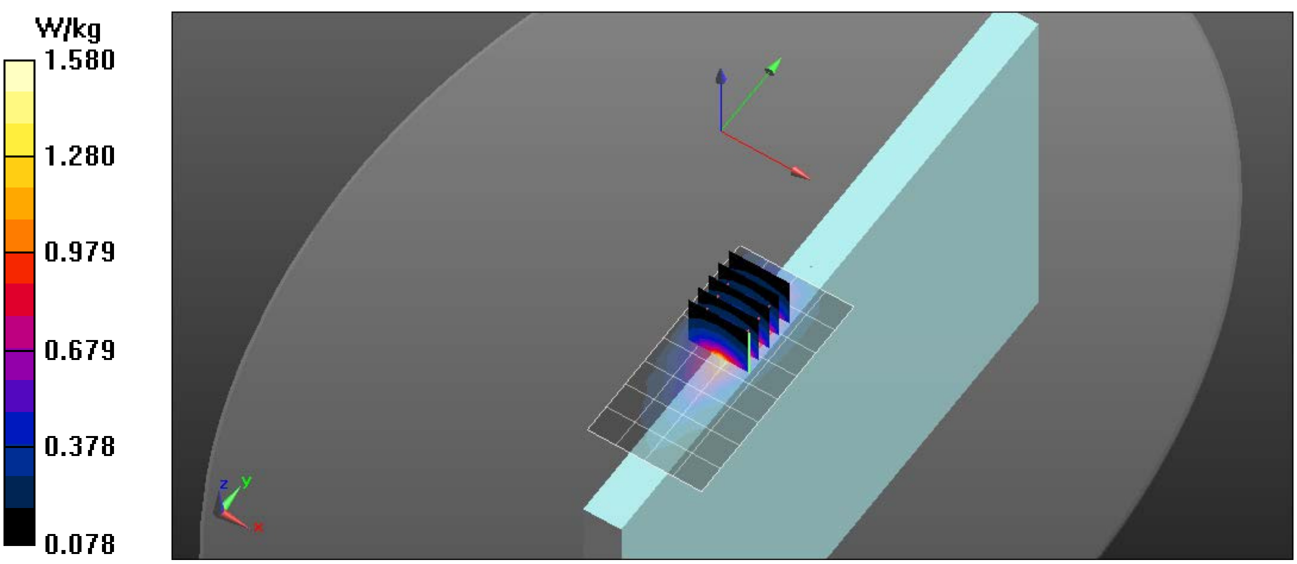
Procedure Notes:

750 MHz B13 LTE/Top Mid 1 RB 24 Offset/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.32 W/kg

750 MHz B13 LTE/Top Mid 1 RB 24 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.93 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 2.25 W/kg
SAR(1 g) = 1.15 W/kg; SAR(10 g) = 0.634 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.58 W/kg



RF Exposure Lab

Plot 2

DUT: iX125R1; Type: Ruggedize Tablet; Serial: 65JKG00024

Communication System: LTE (SC-FDMA, 1 RB, 10 MHz, QPSK); Frequency: 711 MHz; Duty Cycle: 1:1
Medium: MSL750; Medium parameters used (interpolated): f = 711 MHz; σ = 0.98 S/m; ε_r = 55.687; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 8/16/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(9.43, 9.43, 9.43); Calibrated: 4/27/2016;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

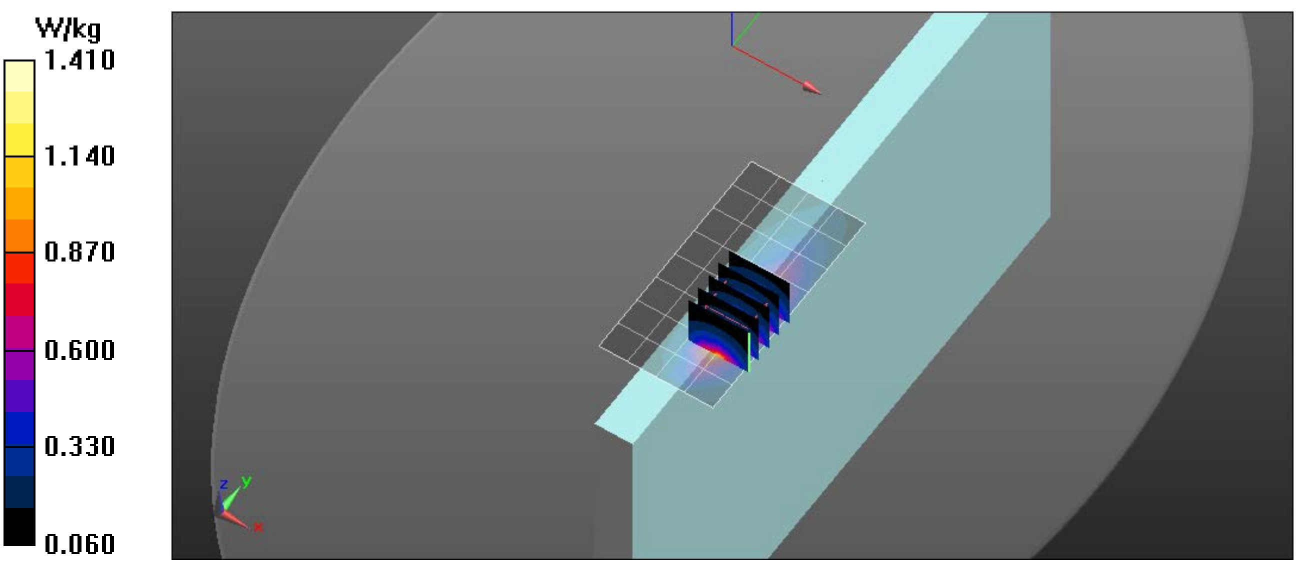
Procedure Notes:

750 MHz B12 LTE/Top High 1RB 24 Offset/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.40 W/kg

750 MHz B12 LTE/Top High 1RB 24 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.05 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.83 W/kg
SAR(1 g) = 1 W/kg; SAR(10 g) = 0.557 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.41 W/kg



RF Exposure Lab

Plot 3

DUT: iX125R1; Type: Ruggedize Tablet; Serial: 65JKG00024

Communication System: UMTS (WCDMA); Frequency: 826.4 MHz; Duty Cycle: 1:1
Medium: MSL835; Medium parameters used (interpolated): f = 826.4 MHz; σ = 0.981 S/m; ε_r = 55.944; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 8/22/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: ES3DV3 - SN3311; ConvF(6.33, 6.33, 6.33); Calibrated: 2/16/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

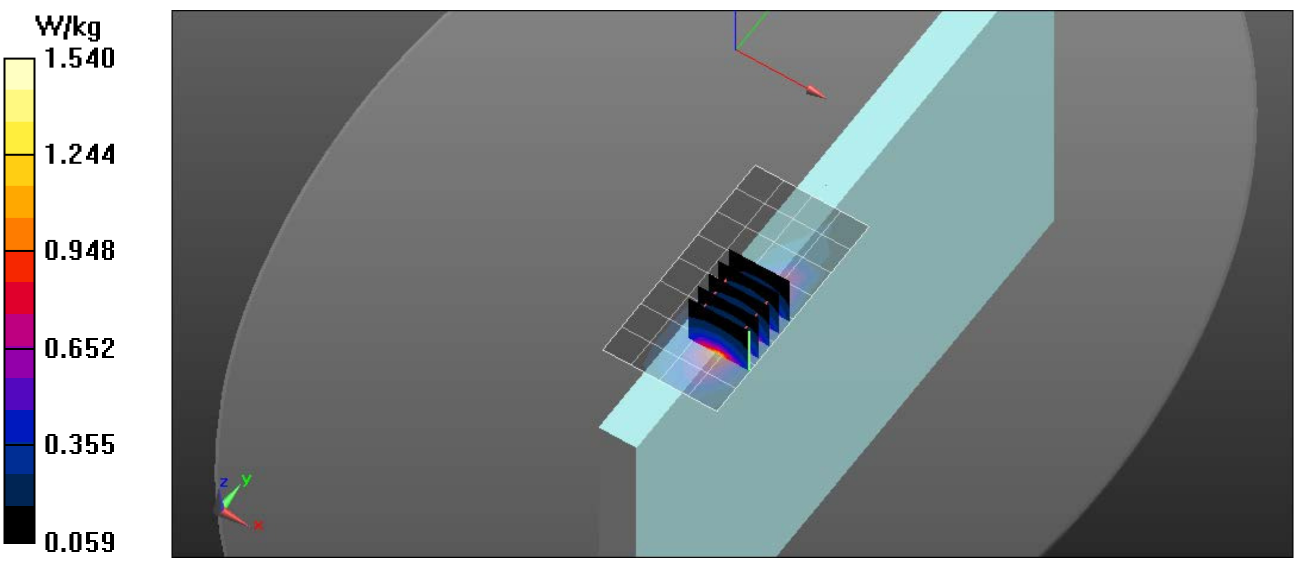
Procedure Notes:

835 MHz WCDMA/Ant 1 Low/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.33 W/kg

835 MHz WCDMA/Ant 1 Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.89 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 2.26 W/kg
SAR(1 g) = 1.02 W/kg; SAR(10 g) = 0.538 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.54 W/kg



RF Exposure Lab

Plot 4

DUT: iX125R1; Type: Ruggedize Tablet; Serial: 65JKG00024

Communication System: LTE (SC-FDMA, 1 RB, 10 MHz, QPSK); Frequency: 819 MHz; Duty Cycle: 1:1
Medium: MSL835; Medium parameters used (interpolated): f = 819 MHz; σ = 0.98 S/m; ε_r = 55.98; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 8/22/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: ES3DV3 - SN3311; ConvF(6.33, 6.33, 6.33); Calibrated: 2/16/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

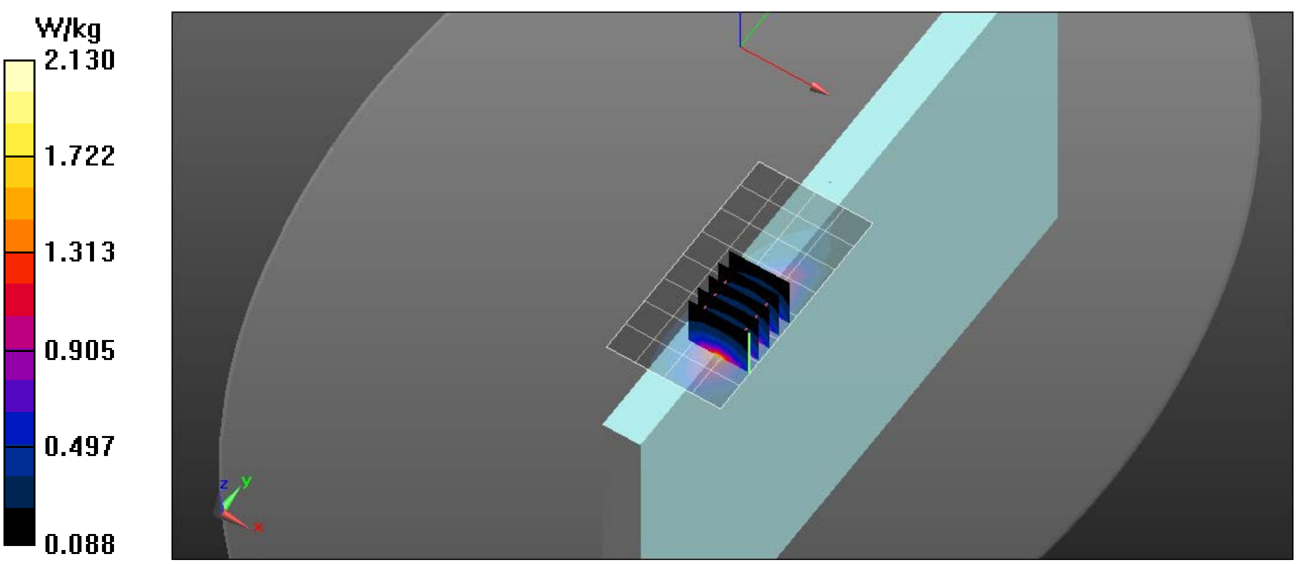
Procedure Notes:

835 MHz B26 LTE/Top Low 1RB 24 Offset/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

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

835 MHz B26 LTE/Top Low 1RB 24 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.48 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.00 W/kg
SAR(1 g) = 1.29 W/kg; SAR(10 g) = 0.703 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.13 W/kg



RF Exposure Lab

Plot 5

DUT: iX125R1; Type: Ruggedize Tablet; Serial: 65JKG00024

Communication System: UMTS (WCDMA); Frequency: 1732.6 MHz; Duty Cycle: 1:1
Medium: MSL1750; Medium parameters used (interpolated): f = 1732.6 MHz; σ = 1.503 S/m; ε_r = 53.375; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 8/22/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3833; ConvF(7.32, 7.32, 7.32); Calibrated: 1/27/2016;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

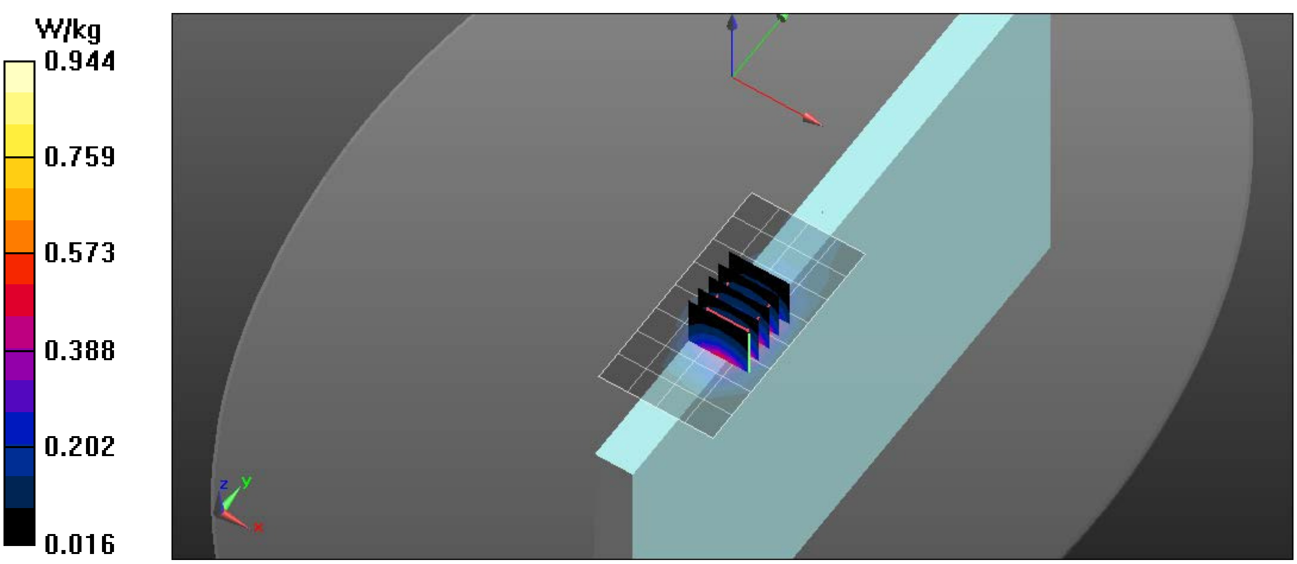
Procedure Notes:

1750 MHz WCDMA/Ant 1 Mid/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.595 W/kg

1750 MHz WCDMA/Ant 1 Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.20 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.19 W/kg
SAR(1 g) = 0.672 W/kg; SAR(10 g) = 0.357 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.944 W/kg



RF Exposure Lab

Plot 6

DUT: iX125R1; Type: Ruggedize Tablet; Serial: 65JKG00024

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: MSL1750; Medium parameters used (interpolated): f = 1732.5 MHz; σ = 1.503 S/m; ε_r = 53.375; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 8/23/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3833; ConvF(7.32, 7.32, 7.32); Calibrated: 1/27/2016;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

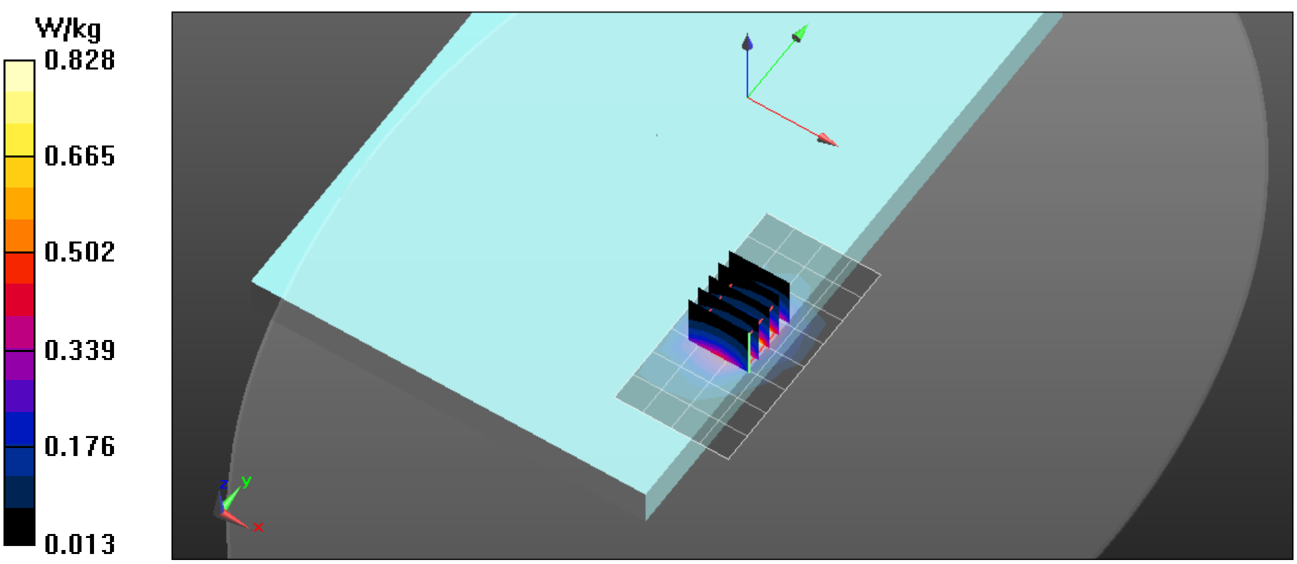
Procedure Notes:

1750 MHz B4 LTE/Back Mid 50 RB 12 Offset/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.848 W/kg

1750 MHz B4 LTE/Back Mid 50 RB 12 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.32 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.07 W/kg
SAR(1 g) = 0.607 W/kg; SAR(10 g) = 0.328 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.828 W/kg



RF Exposure Lab

Plot 7

DUT: iX125R1; Type: Ruggedize Tablet; Serial: 65JKG00024

Communication System: UMTS (WCDMA); Frequency: 1852.4 MHz; Duty Cycle: 1:1
Medium: MSL1900; Medium parameters used (interpolated): f = 1852.4 MHz; σ = 1.44 S/m; ε_r = 52.03; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 8/18/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(7.49, 7.49, 7.49); Calibrated: 4/27/2016;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

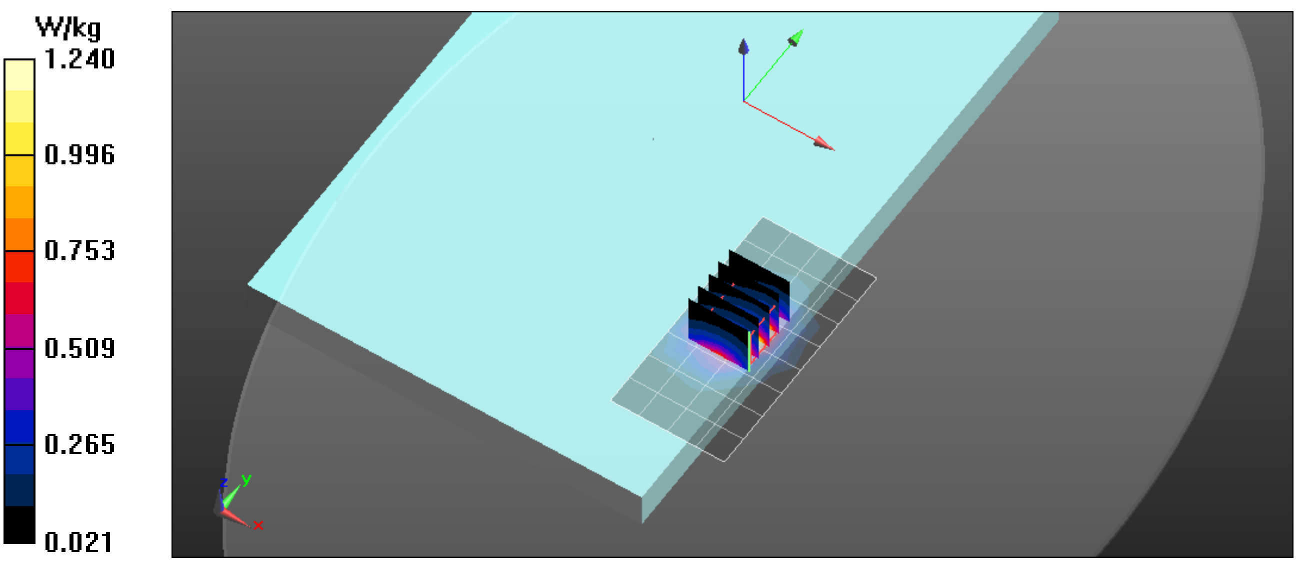
Procedure Notes:

1900 MHz WCDMA/Ant 2 Low/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.33 W/kg

1900 MHz WCDMA/Ant 2 Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.40 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.64 W/kg
SAR(1 g) = 0.960 W/kg; SAR(10 g) = 0.523 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.24 W/kg



RF Exposure Lab

Plot 8

DUT: iX125R1; Type: Ruggedize Tablet; Serial: 65JKG00024

Communication System: LTE (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 1882.5 MHz; Duty Cycle: 1:1
Medium: MSL1900; Medium parameters used (interpolated): f = 1882.5 MHz; σ = 1.453 S/m; ε_r = 52.118; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 8/17/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(7.49, 7.49, 7.49); Calibrated: 4/27/2016;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

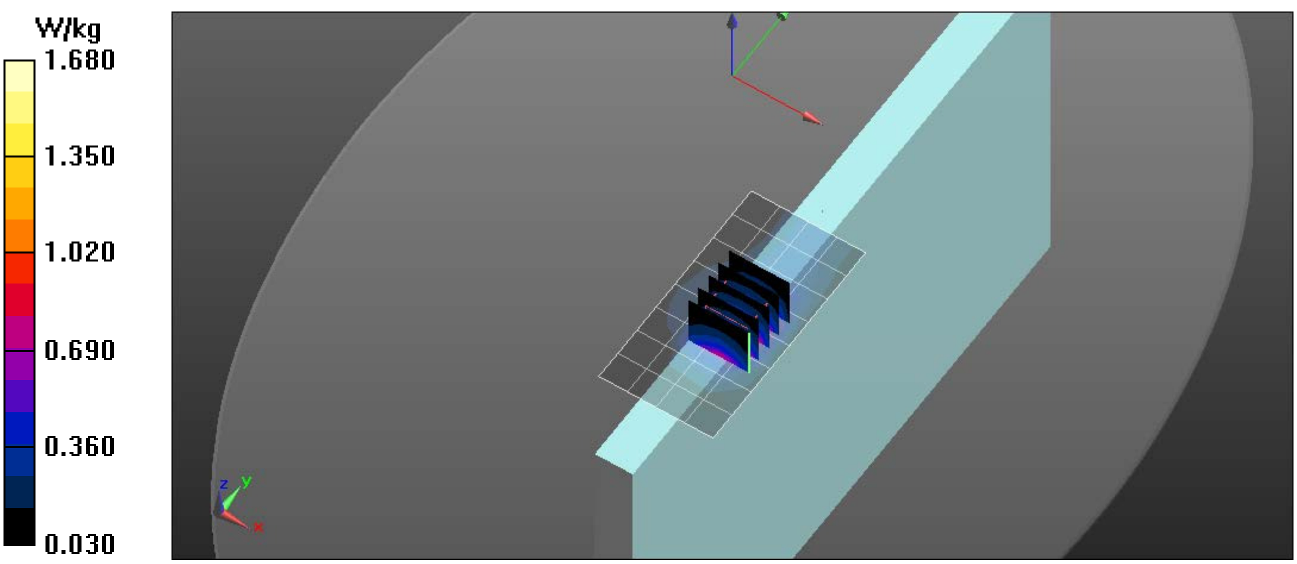
Procedure Notes:

1900 MHz B25 LTE/Top Mid 1RB 24 Offset/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.01 W/kg

1900 MHz B25 LTE/Top Mid 1RB 24 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.84 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 2.07 W/kg
SAR(1 g) = 1.17 W/kg; SAR(10 g) = 0.625 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.68 W/kg



RF Exposure Lab

Plot 9

DUT: iX125R1; Type: Ruggedize Tablet; Serial: 65JKG00024

Communication System: LTE (SC-FDMA, 1 RB, 10 MHz, QPSK); Frequency: 2310 MHz; Duty Cycle: 1:1
Medium: MSL2300; Medium parameters used: f = 2310 MHz; σ = 1.85 S/m; ε_r = 52.61; ρ = 1000 kg/m^3
Phantom section: Flat Section

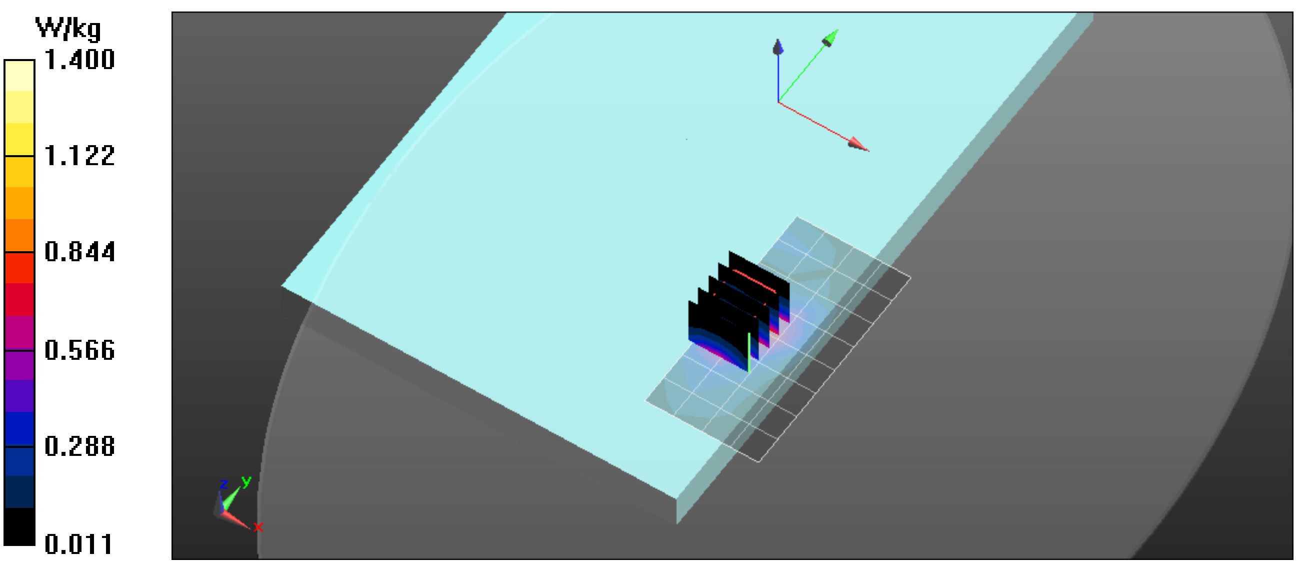
Test Date: Date: 8/19/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: ES3DV3 - SN3311; ConvF(4.69, 4.69, 4.69); Calibrated: 2/16/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Procedure Notes:

2300 MHz B30 LTE/Back Mid 1 RB 24 Offset/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.929 W/kg

2300 MHz B30 LTE/Back Mid 1 RB 24 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.41 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 2.21 W/kg
SAR(1 g) = 1.02 W/kg; SAR(10 g) = 0.492 W/kg
Maximum value of SAR (measured) = 1.40 W/kg



RF Exposure Lab

Plot 10

DUT: iX125R1; Type: Ruggedize Tablet; Serial: 65JKG00024

Communication System: LTE (SC-FDMA, 50% RB, 20 MHz, QPSK); Frequency: 2535 MHz; Duty Cycle: 1:1
Medium: MSL2550; Medium parameters used (interpolated): f = 2535 MHz; σ = 2.10 S/m; ε_r = 52.495; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 8/19/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: ES3DV3 - SN3311; ConvF(4.17, 4.17, 4.17); Calibrated: 2/16/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

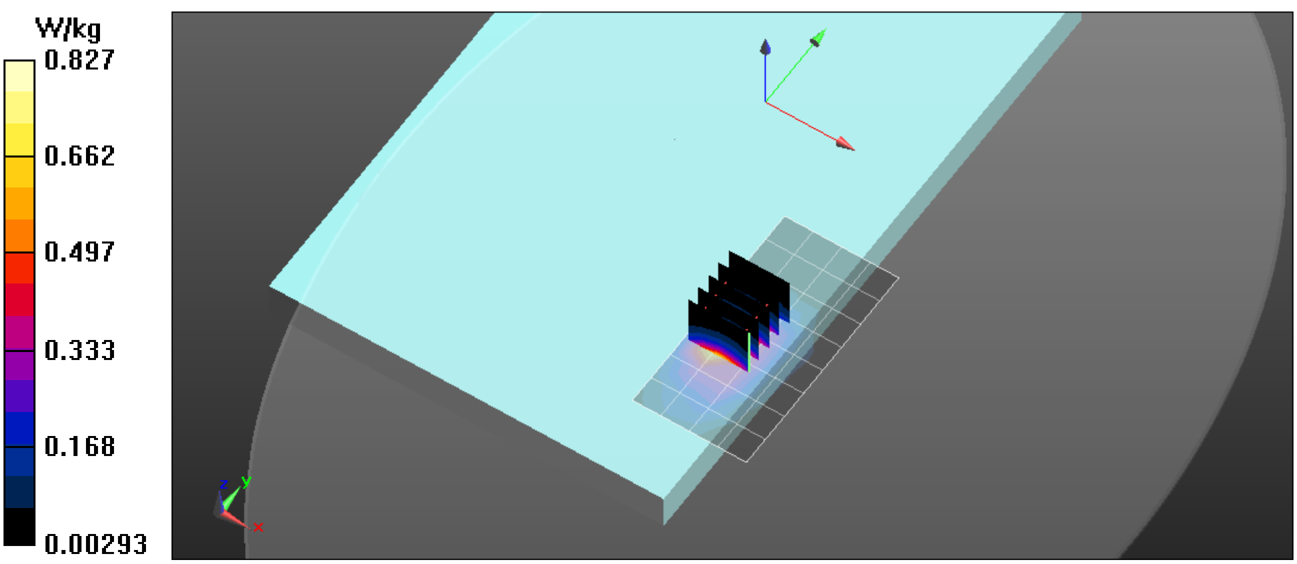
Procedure Notes:

2600 MHz B7 LTE/Back Mid 50 RB 24 Offset/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.890 W/kg

2600 MHz B7 LTE/Back Mid 50 RB 24 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.58 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.62 W/kg
SAR(1 g) = 0.706 W/kg; SAR(10 g) = 0.324 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.827 W/kg



RF Exposure Lab

Plot 11

DUT: iX125R1; Type: Ruggedize Tablet; Serial: 65JKG00024

Communication System: LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK); Frequency: 2593 MHz; Duty Cycle: 1:1.58
Medium: MSL2550; Medium parameters used (interpolated): f = 2593 MHz; σ = 2.196 S/m; ε_r = 52.387; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 8/20/2016; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: ES3DV3 - SN3311; ConvF(4.17, 4.17, 4.17); Calibrated: 2/16/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1217; Calibrated: 2/9/2016
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 2037
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

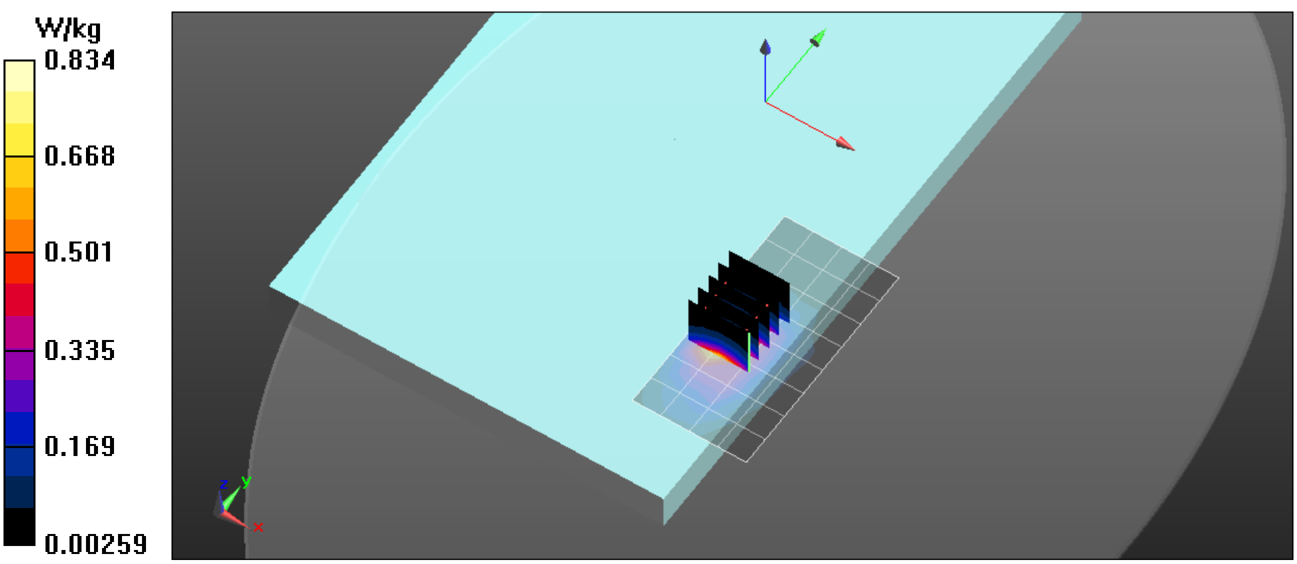
Procedure Notes:

2600 MHz B7 LTE/Back Mid 1RB 49 Offset/Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm

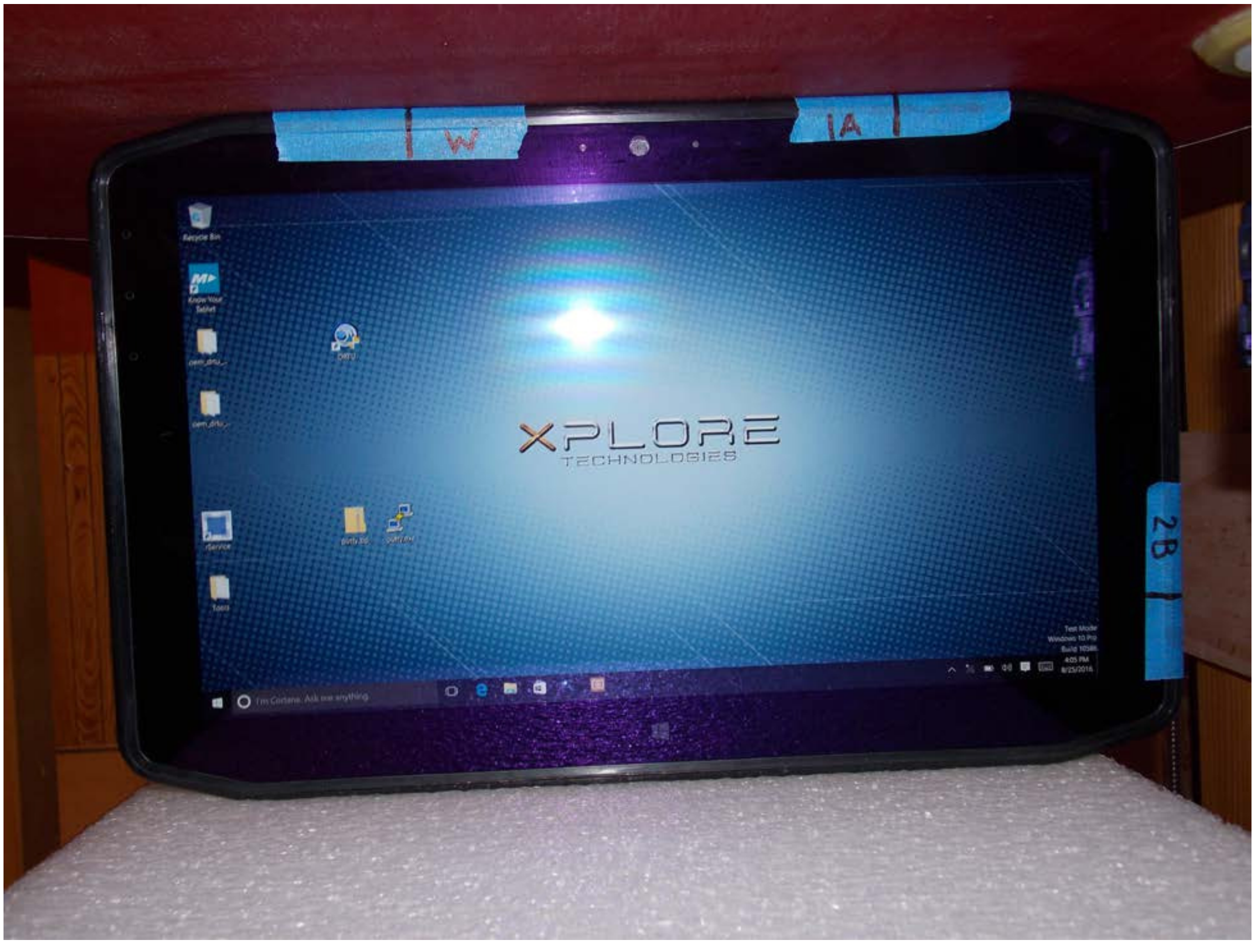
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.875 W/kg

2600 MHz B7 LTE/Back Mid 1RB 49 Offset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.59 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.58 W/kg
SAR(1 g) = 0.695 W/kg; SAR(10 g) = 0.318 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.834 W/kg



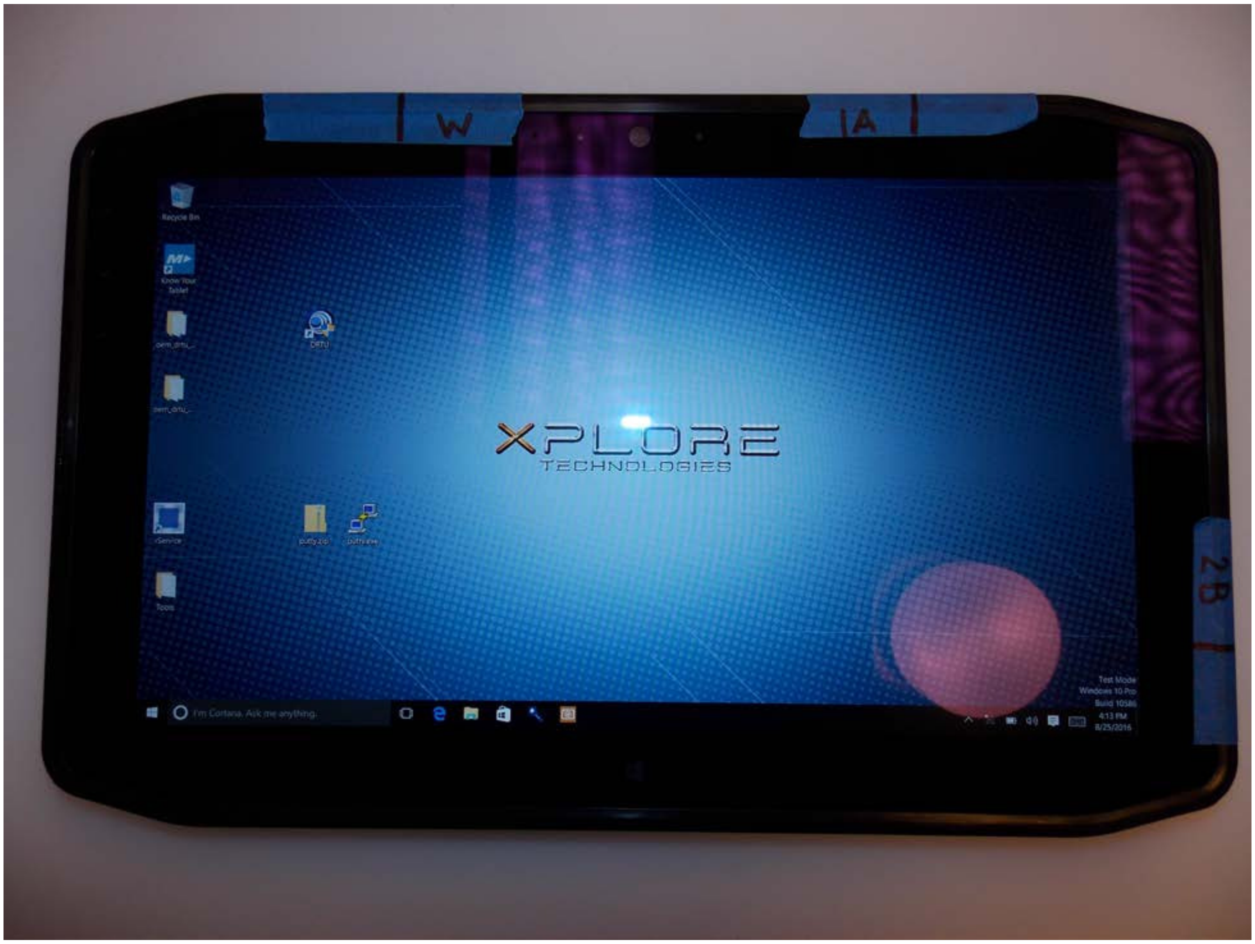
Appendix C – SAR Test Setup Photos



Test Configuration Top 0 mm Gap

Test Configuration Back 0 mm Gap

Test Configuration Left Side 0 mm Gap



Front of Device

Back of Device

Appendix D – Probe Calibration Data Sheets

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: ES3-3311_Feb16

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3311

Calibration procedure(s): QA CAL-01.v9, QA CAL-12.v9, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: February 16, 2016

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 E4419B	GB41293874	01-Apr-15 (No. 217-02128)	Mar-16
Power sensor E4412A	MY41498087	01-Apr-15 (No. 217-02128)	Mar-16
Reference 3 dB Attenuator	SN: S5054 (3c)	01-Apr-15 (No. 217-02129)	Mar-16
Reference 20 dB Attenuator	SN: S5277 (20x)	01-Apr-15 (No. 217-02132)	Mar-16
Reference 30 dB Attenuator	SN: S5129 (30b)	01-Apr-15 (No. 217-02133)	Mar-16
Reference Probe ES3DV2	SN: 3013	31-Dec-15 (No. ES3-3013_Dec15)	Dec-16
DAE4	SN: 660	23-Dec-15 (No. DAE4-660_Dec15)	Dec-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

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

Issued: February 18, 2016

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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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).

Probe ES3DV3

SN:3311

Manufactured: July 5, 2011
Calibrated: February 16, 2016

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3311

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.28	1.07	0.47	± 10.1 %
DCP (mV)[B]	103.8	103.5	101.2	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB$\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	220.4	±3.0 %
		Y	0.0	0.0	1.0		222.4	
		Z	0.0	0.0	1.0		211.8	

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: ES3DV3 - SN:3311

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)
300	45.3	0.87	7.52	7.52	7.52	0.15	1.71	± 13.3 %
600	42.7	0.88	6.73	6.73	6.73	0.15	1.50	± 13.3 %
835	41.5	0.90	6.43	6.43	6.43	0.40	1.75	± 12.0 %
1640	40.3	1.29	5.49	5.49	5.49	0.47	1.54	± 12.0 %
2300	39.5	1.67	4.92	4.92	4.92	0.79	1.24	± 12.0 %
2450	39.2	1.80	4.64	4.64	4.64	0.80	1.30	± 12.0 %
2600	39.0	1.96	4.44	4.44	4.44	0.80	1.35	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. 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: ES3DV3 - SN:3311

Calibration Parameter Determined in Body Tissue Simulating Media

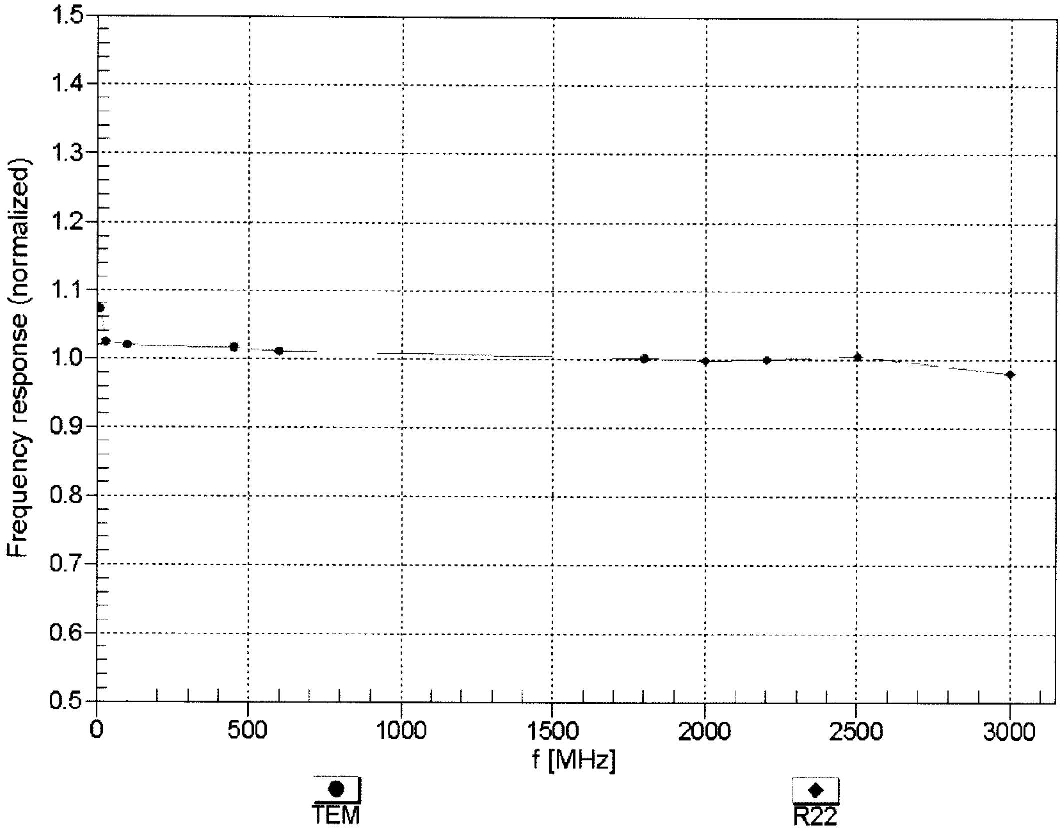
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
300	58.2	0.92	7.31	7.31	7.31	0.13	1.00	± 13.3 %
600	56.1	0.95	6.76	6.76	6.76	0.12	1.50	± 13.3 %
835	55.2	0.97	6.33	6.33	6.33	0.62	1.40	± 12.0 %
1640	53.8	1.40	5.33	5.33	5.33	0.51	1.53	± 12.0 %
2300	52.9	1.81	4.69	4.69	4.69	0.80	1.25	± 12.0 %
2450	52.7	1.95	4.43	4.43	4.43	0.80	1.20	± 12.0 %
2600	52.5	2.16	4.17	4.17	4.17	0.80	1.22	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. 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.

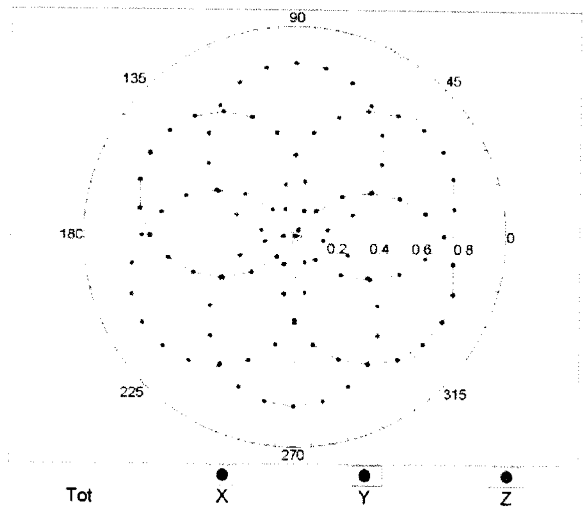
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



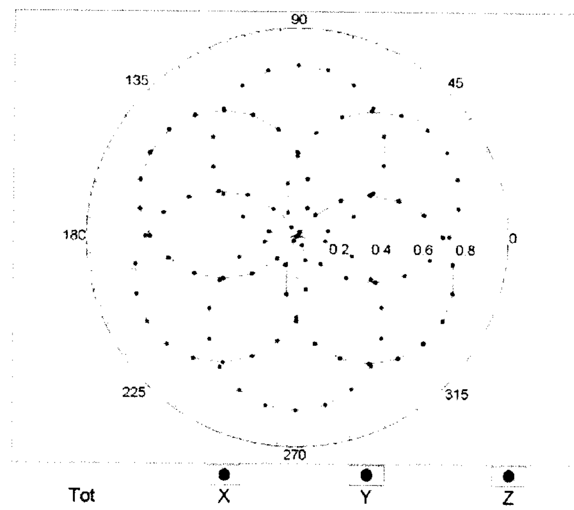
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

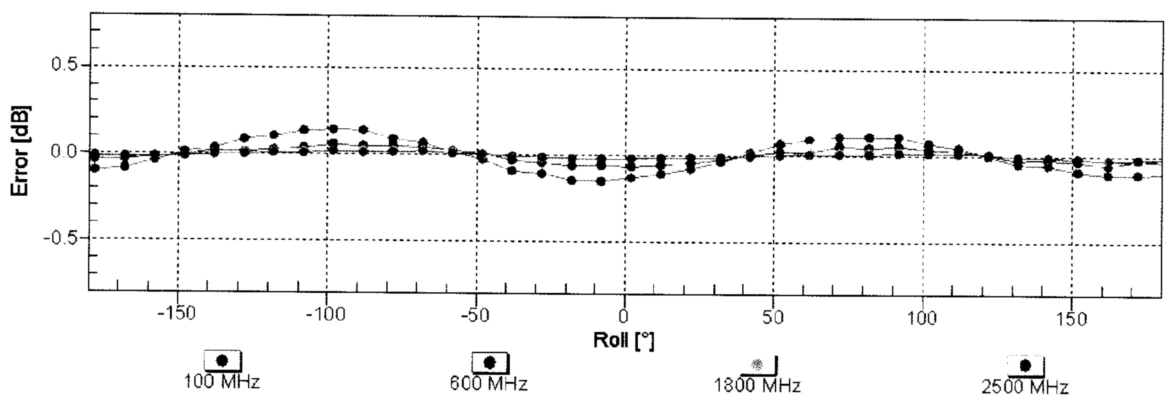
Receiving Pattern (ϕ), $\vartheta = 0°$

f=600 MHz,TEM



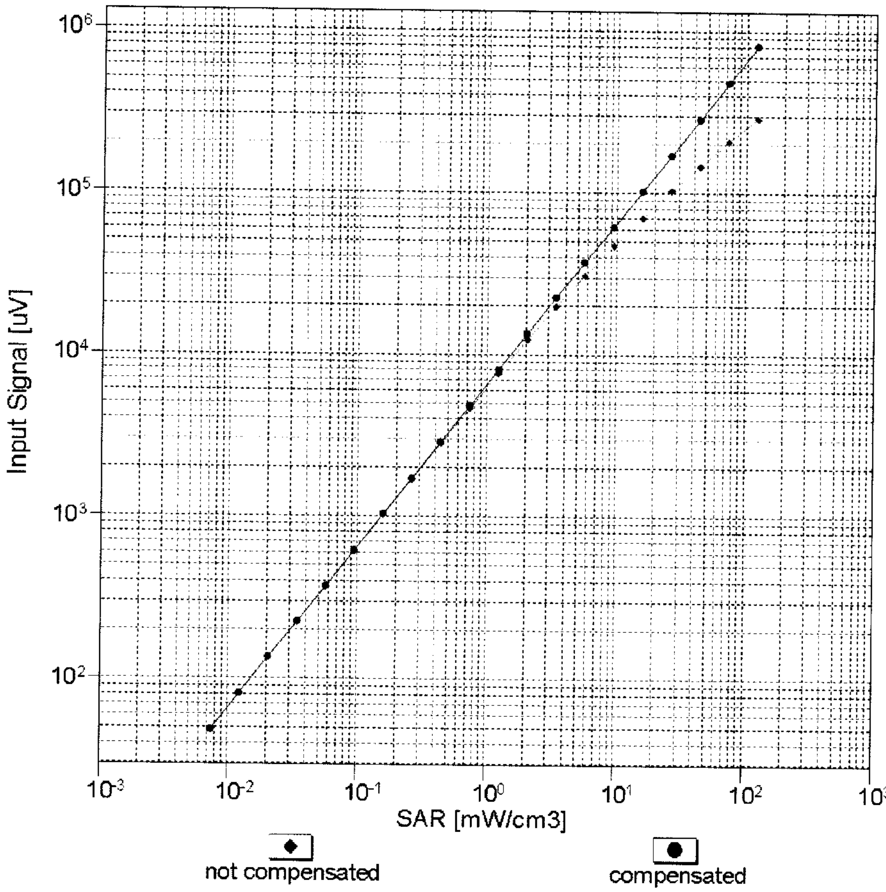
f=1800 MHz,R22

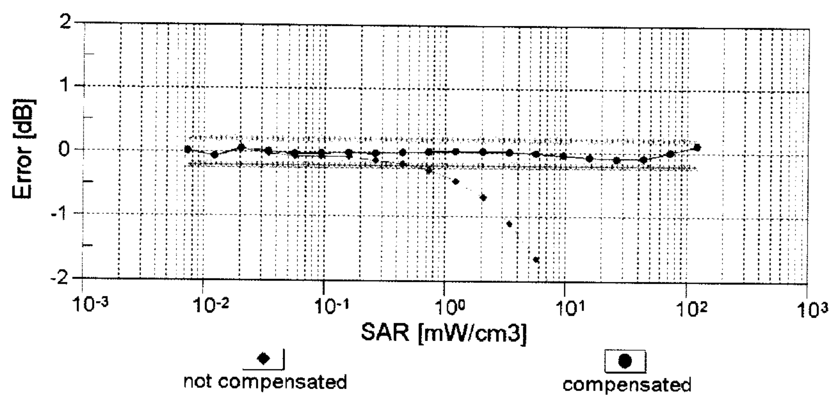




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

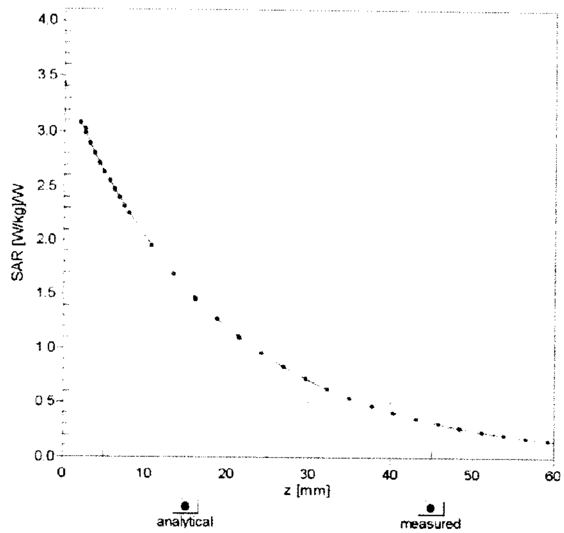




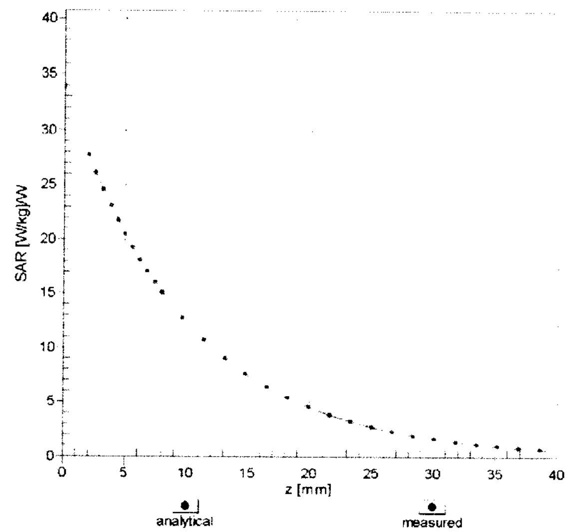
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

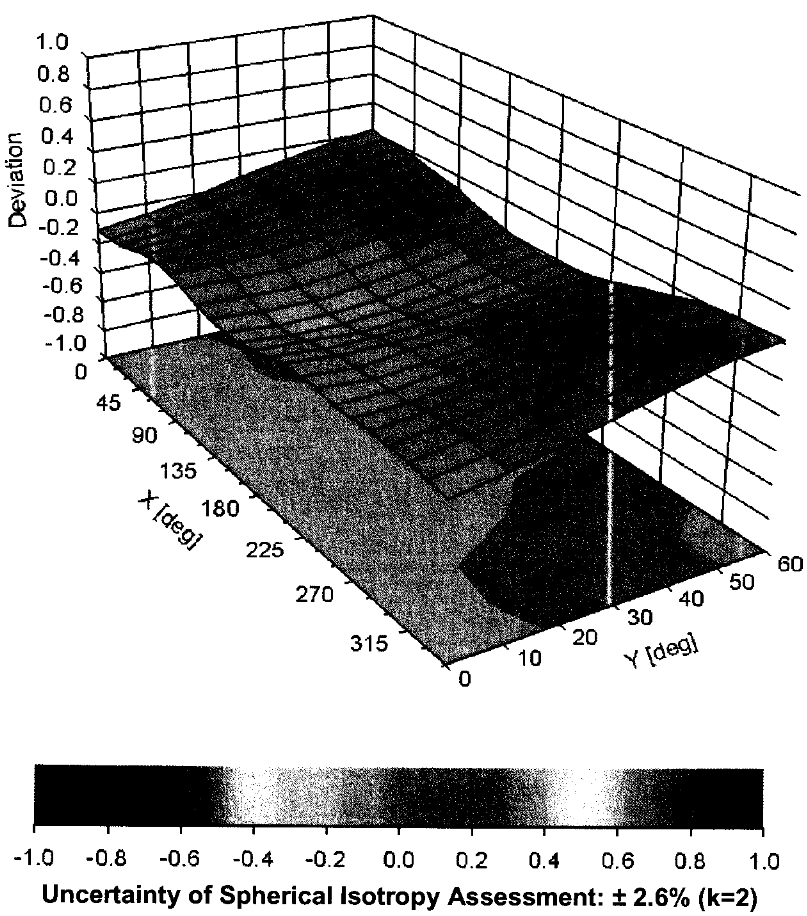


f = 2300 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3311

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	61.9
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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

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

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

Accreditation No.: SCS 0108

Client RF Exposure Lab

Certificate No: EX3-3662_Apr16

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3662
Calibration procedure(s)	QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	April 27, 2016

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	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: S5277 (20x)	05-Apr-16 (No. 217-02293)	Apr-17
Reference Probe ES3DV2	SN: 3013	31-Dec-15 (No. ES3-3013_Dec15)	Dec-16
DAE4	SN: 660	23-Dec-15 (No. DAE4-660_Dec15)	Dec-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (No. 217-02285/02284)	In house check: Jun-16
Power sensor E4412A	SN: MY41498087	06-Apr-16 (No. 217-02285)	In house check: Jun-16
Power sensor E4412A	SN: 000110210	06-Apr-16 (No. 217-02284)	In house check: Jun-16
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Apr-13)	In house check: Jun-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

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

Issued: April 27, 2016

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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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).

Probe EX3DV4

SN:3662

Manufactured: October 20, 2008
Calibrated: April 27, 2016

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.43	0.47	0.51	± 10.1 %
DCP (mV)[B]	100.4	100.5	97.5	

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	210.8	±3.3 %
		Y	0.0	0.0	1.0		193.7	
		Z	0.0	0.0	1.0		192.9	

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

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	52.3	0.76	11.30	11.30	11.30	0.00	1.00	± 13.3 %
220	49.0	0.81	10.90	10.90	10.90	0.00	1.00	± 13.3 %
450	43.5	0.87	11.07	11.07	11.07	0.17	1.20	± 13.3 %
750	41.9	0.89	9.43	9.43	9.43	0.35	0.80	± 12.0 %
835	41.5	0.90	9.05	9.05	9.05	0.41	0.80	± 12.0 %
900	41.5	0.97	8.97	8.97	8.97	0.30	1.00	± 12.0 %
1450	40.5	1.20	8.52	8.52	8.52	0.36	0.80	± 12.0 %
1900	40.0	1.40	7.61	7.61	7.61	0.41	0.80	± 12.0 %
2450	39.2	1.80	7.08	7.08	7.08	0.27	0.98	± 12.0 %
5200	36.0	4.66	5.03	5.03	5.03	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.82	4.82	4.82	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.76	4.76	4.76	0.45	1.80	± 13.1 %
5600	35.5	5.07	4.53	4.53	4.53	0.50	1.80	± 13.1 %
5800	35.3	5.27	4.55	4.55	4.55	0.50	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. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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

Calibration Parameter Determined in Body Tissue Simulating Media

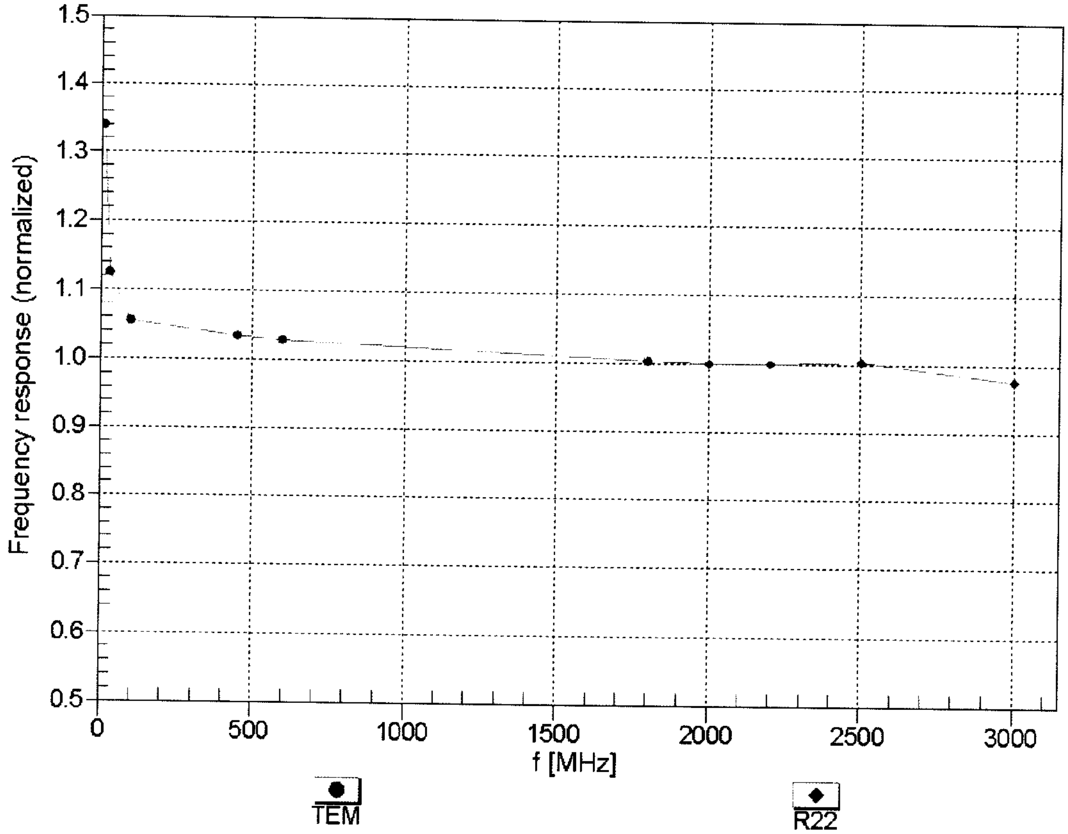
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	61.9	0.80	10.92	10.92	10.92	0.00	1.00	± 13.3 %
220	60.2	0.86	10.27	10.27	10.27	0.00	1.00	± 13.3 %
450	56.7	0.94	10.63	10.63	10.63	0.09	1.20	± 13.3 %
750	55.5	0.96	9.22	9.22	9.22	0.53	0.80	± 12.0 %
835	55.2	0.97	9.07	9.07	9.07	0.38	0.95	± 12.0 %
900	55.0	1.05	8.94	8.94	8.94	0.39	0.91	± 12.0 %
1900	53.3	1.52	7.49	7.49	7.49	0.35	0.80	± 12.0 %
2450	52.7	1.95	7.17	7.17	7.17	0.37	0.80	± 12.0 %
5200	49.0	5.30	4.36	4.36	4.36	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.05	4.05	4.05	0.55	1.90	± 13.1 %
5500	48.6	5.65	3.75	3.75	3.75	0.60	1.90	± 13.1 %
5600	48.5	5.77	3.60	3.60	3.60	0.60	1.90	± 13.1 %
5800	48.2	6.00	3.85	3.85	3.85	0.60	1.90	± 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. 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.

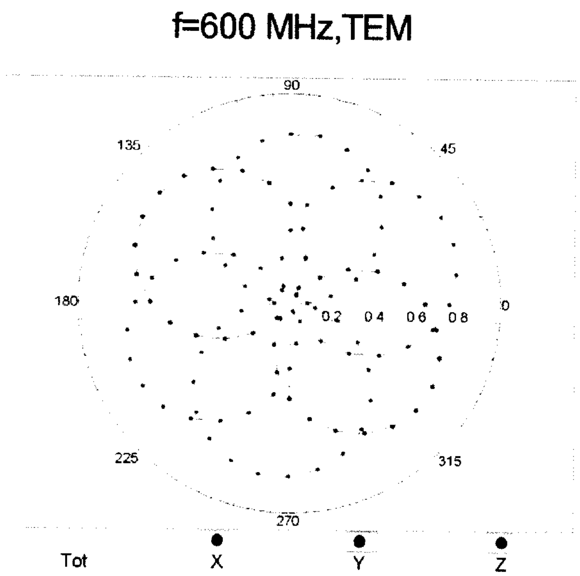
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

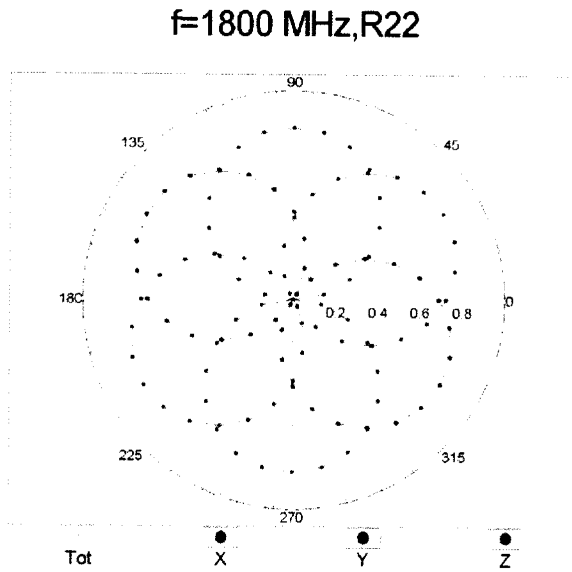
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)

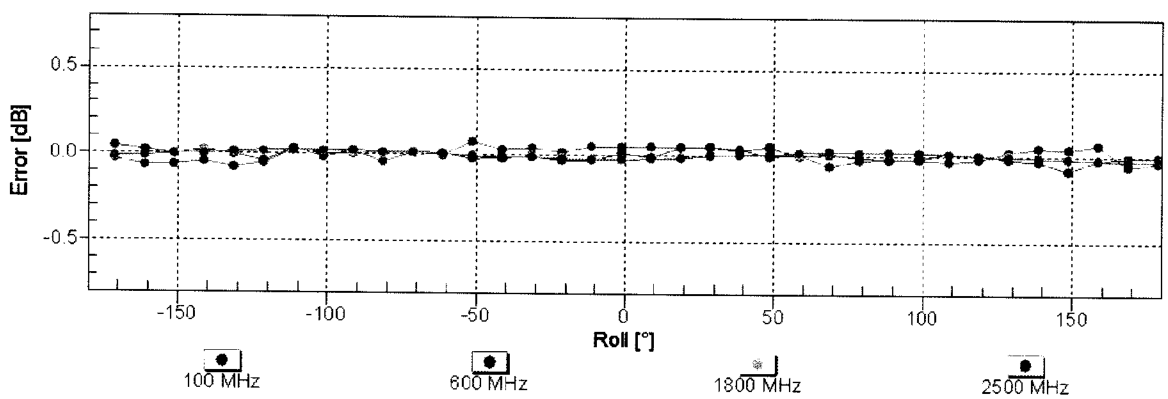


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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

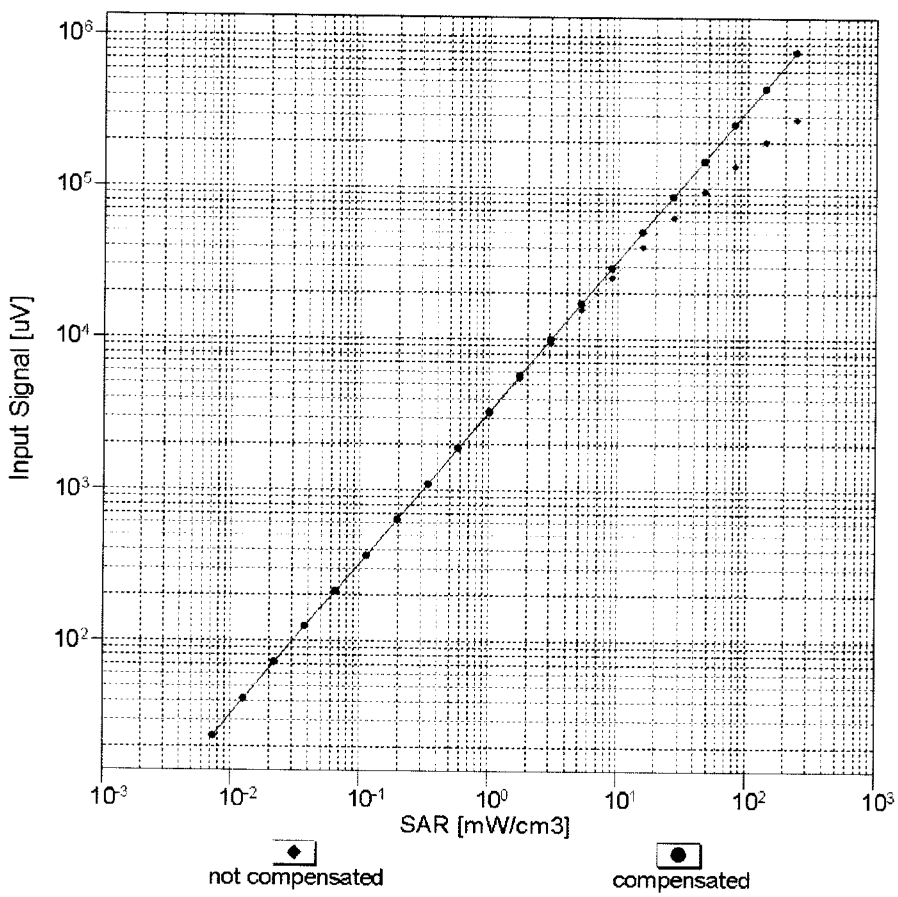


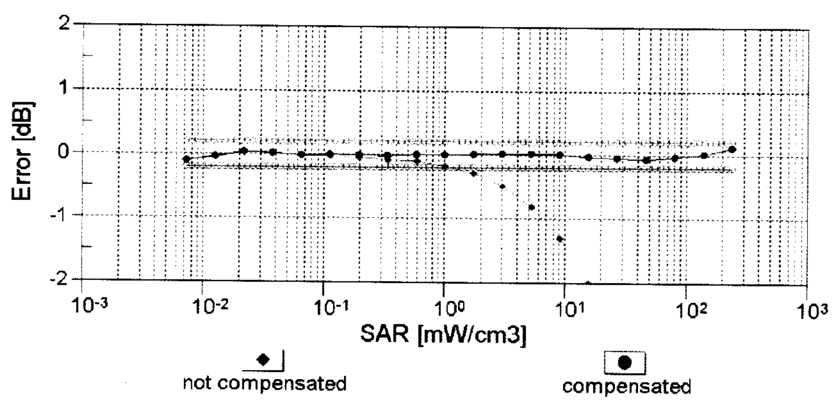




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

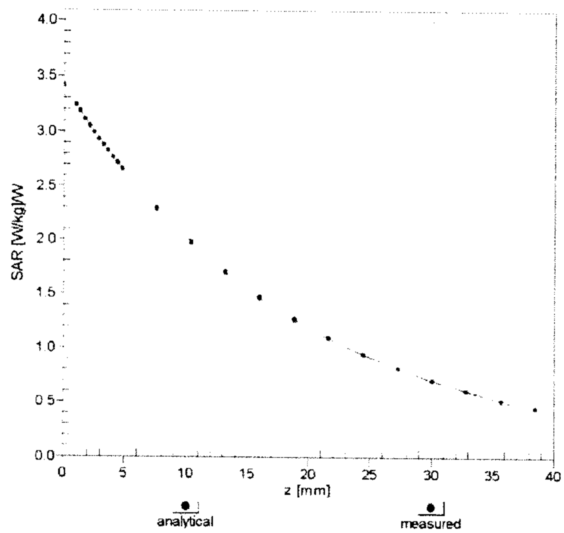




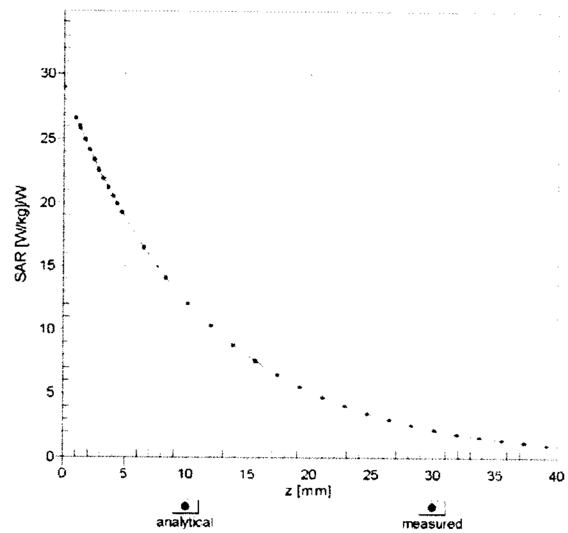
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

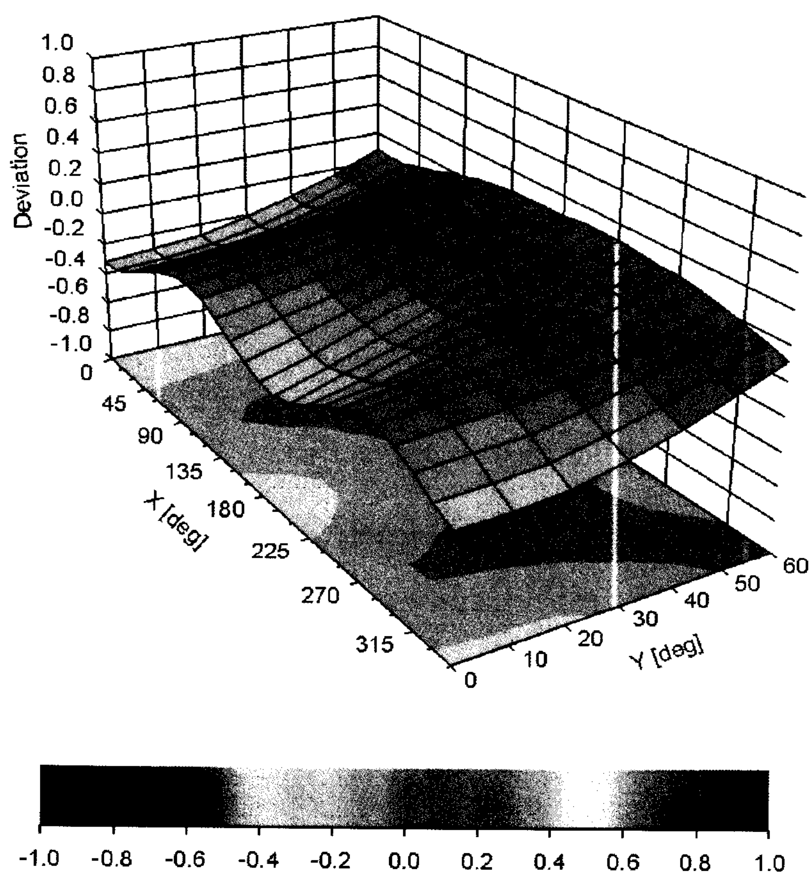


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-31.4
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

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: EX3-3833_Jan16

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3833

Calibration procedure(s): QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: January 27, 2016

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 E4419B	GB41293874	01-Apr-15 (No. 217-02128)	Mar-16
Power sensor E4412A	MY41498087	01-Apr-15 (No. 217-02128)	Mar-16
Reference 3 dB Attenuator	SN: S5054 (3c)	01-Apr-15 (No. 217-02129)	Mar-16
Reference 20 dB Attenuator	SN: S5277 (20x)	01-Apr-15 (No. 217-02132)	Mar-16
Reference 30 dB Attenuator	SN: S5129 (30b)	01-Apr-15 (No. 217-02133)	Mar-16
Reference Probe ES3DV2	SN: 3013	31-Dec-15 (No. ES3-3013_Dec15)	Dec-16
DAE4	SN: 660	23-Dec-15 (No. DAE4-660_Dec15)	Dec-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

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

Issued: January 28, 2016

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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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).

Probe EX3DV4

SN:3833

Manufactured: November 7, 2011
Calibrated: January 27, 2016

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3833

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.47	0.49	0.35	± 10.1 %
DCP (mV)[B]	100.8	100.2	102.7	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB$\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	131.4	±2.5 %
		Y	0.0	0.0	1.0		134.5	
		Z	0.0	0.0	1.0		128.6	

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:3833

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	52.3	0.76	11.38	11.38	11.38	0.00	1.00	± 13.3 %
220	49.0	0.81	10.71	10.71	10.71	0.00	1.00	± 13.3 %
300	45.3	0.87	10.68	10.68	10.68	0.08	1.15	± 13.3 %
450	43.5	0.87	9.47	9.47	9.47	0.15	1.15	± 13.3 %
600	42.7	0.88	9.41	9.41	9.41	0.09	1.15	± 13.3 %
750	41.9	0.89	9.23	9.23	9.23	0.37	1.00	± 12.0 %
900	41.5	0.97	8.72	8.72	8.72	0.29	1.17	± 12.0 %
1640	40.3	1.29	7.85	7.85	7.85	0.41	0.88	± 12.0 %
1750	40.1	1.37	7.62	7.62	7.62	0.46	0.80	± 12.0 %
1900	40.0	1.40	7.27	7.27	7.27	0.45	0.80	± 12.0 %
2450	39.2	1.80	6.86	6.86	6.86	0.39	0.91	± 12.0 %
5200	36.0	4.66	4.64	4.64	4.64	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.47	4.47	4.47	0.35	1.80	± 13.1 %
5500	35.6	4.96	4.23	4.23	4.23	0.40	1.80	± 13.1 %
5600	35.5	5.07	3.94	3.94	3.94	0.45	1.80	± 13.1 %
5800	35.3	5.27	4.11	4.11	4.11	0.45	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. 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.

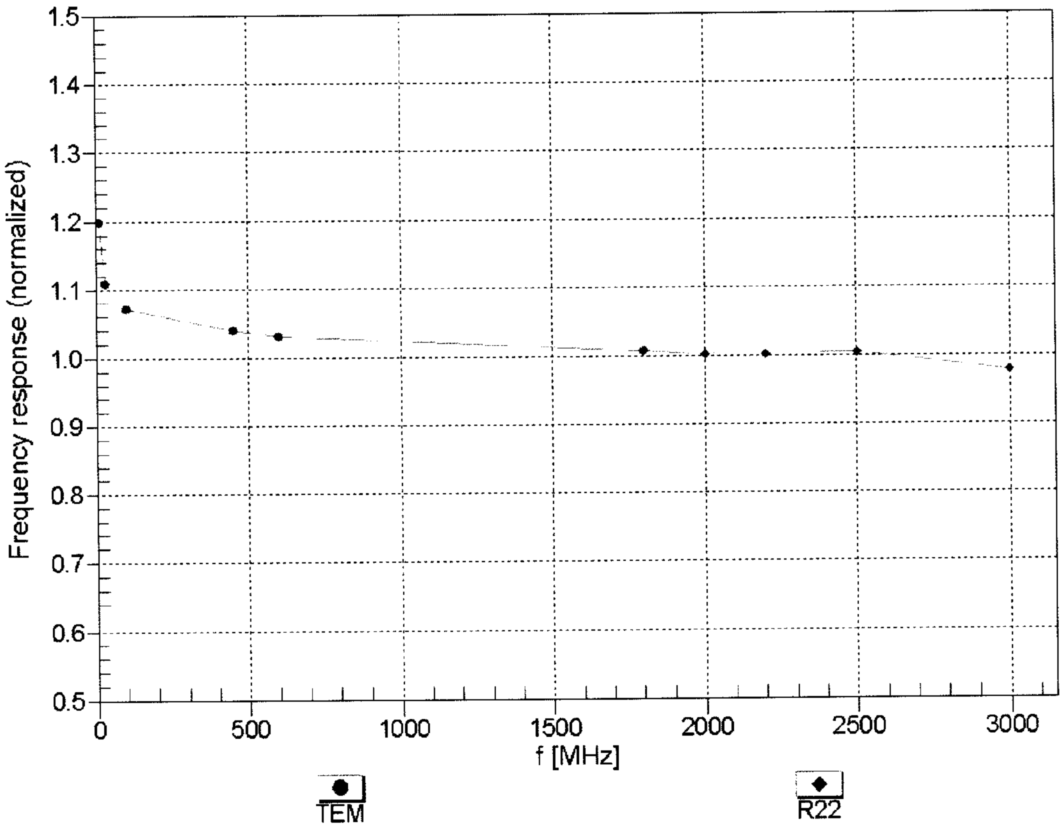
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3833

Calibration Parameter Determined in Body 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	61.9	0.80	11.03	11.03	11.03	0.00	1.00	± 13.3 %
220	60.2	0.86	10.39	10.39	10.39	0.00	1.00	± 13.3 %
300	58.2	0.92	10.08	10.08	10.08	0.07	1.15	± 13.3 %
450	56.7	0.94	10.23	10.23	10.23	0.09	1.15	± 13.3 %
600	56.1	0.95	9.68	9.68	9.68	0.08	1.15	± 13.3 %
750	55.5	0.96	9.06	9.06	9.06	0.44	0.87	± 12.0 %
900	55.0	1.05	8.73	8.73	8.73	0.32	1.06	± 12.0 %
1640	53.8	1.40	7.77	7.77	7.77	0.38	0.82	± 12.0 %
1750	53.4	1.49	7.32	7.32	7.32	0.42	0.84	± 12.0 %
1900	53.3	1.52	7.13	7.13	7.13	0.38	0.80	± 12.0 %
2450	52.7	1.95	6.87	6.87	6.87	0.40	0.85	± 12.0 %
5200	49.0	5.30	4.03	4.03	4.03	0.45	1.90	± 13.1 %
5300	48.9	5.42	3.85	3.85	3.85	0.45	1.90	± 13.1 %
5500	48.6	5.65	3.56	3.56	3.56	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.25	3.25	3.25	0.60	1.90	± 13.1 %
5800	48.2	6.00	3.49	3.49	3.49	0.60	1.90	± 13.1 %

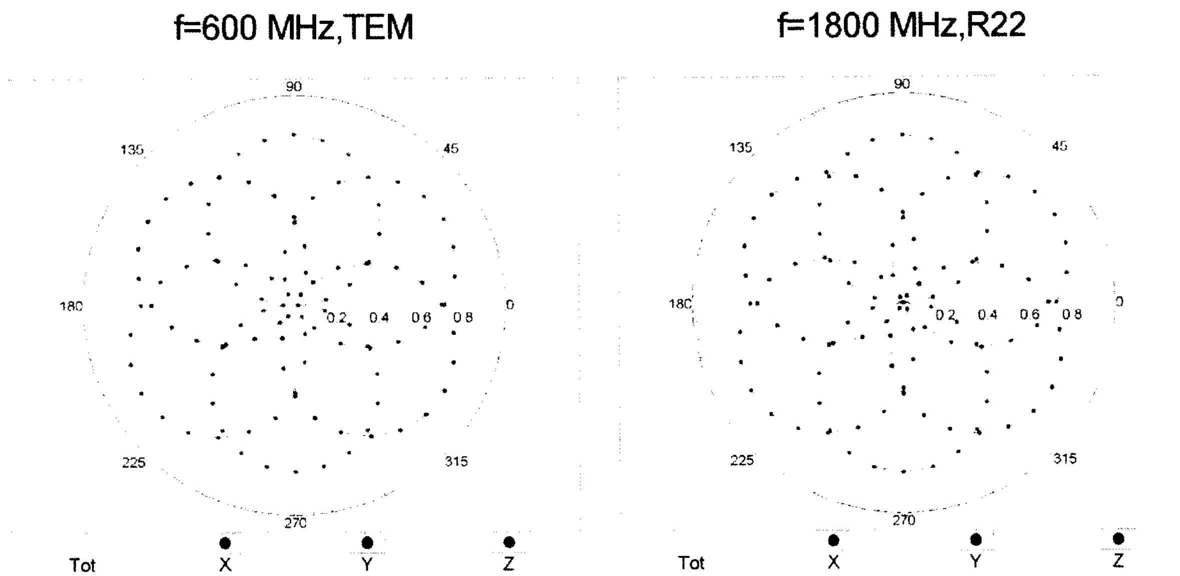
[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. 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.

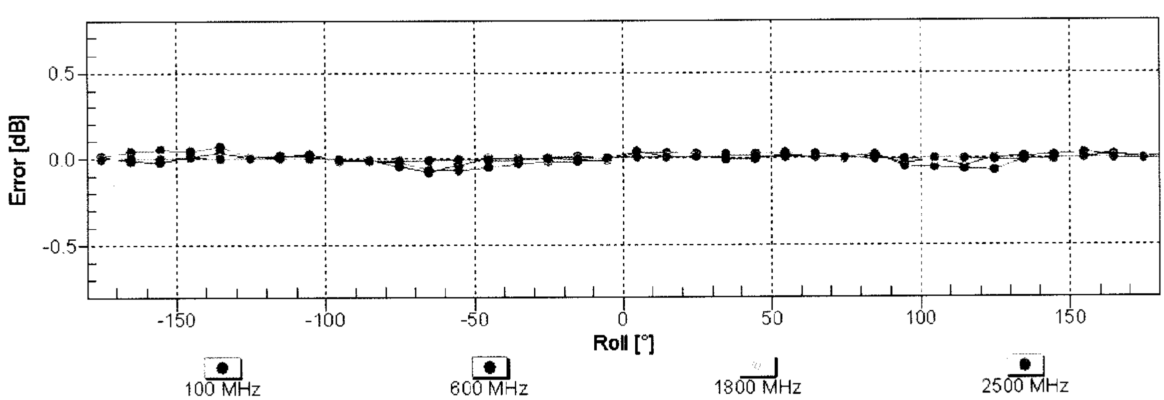
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

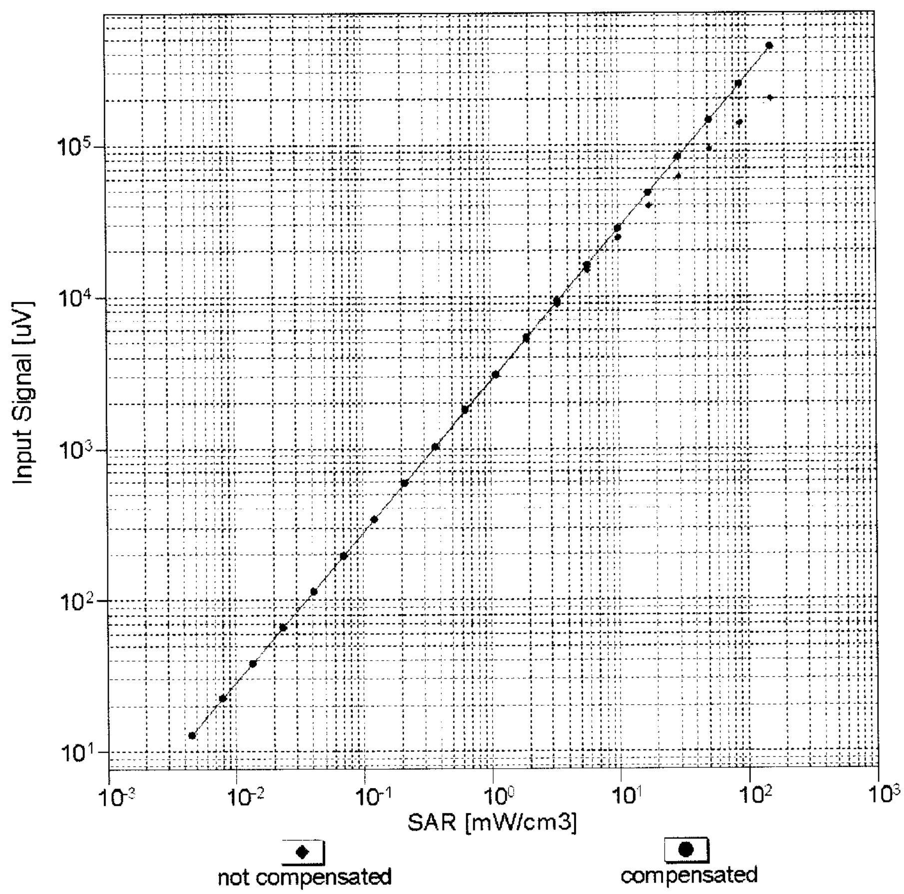
Receiving Pattern (ϕ), ϑ = 0°

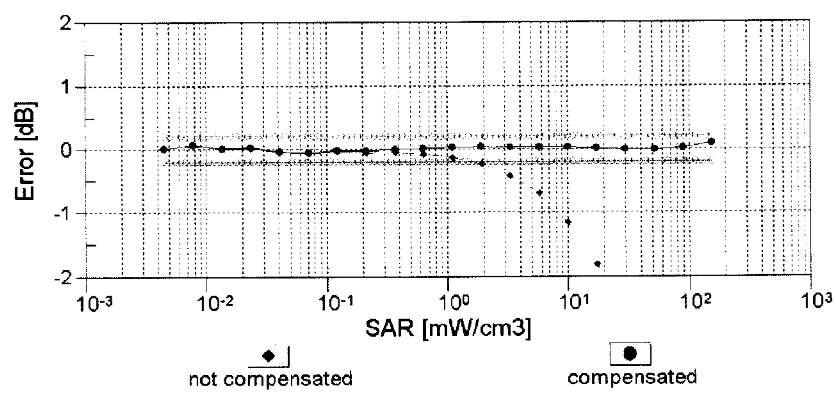




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

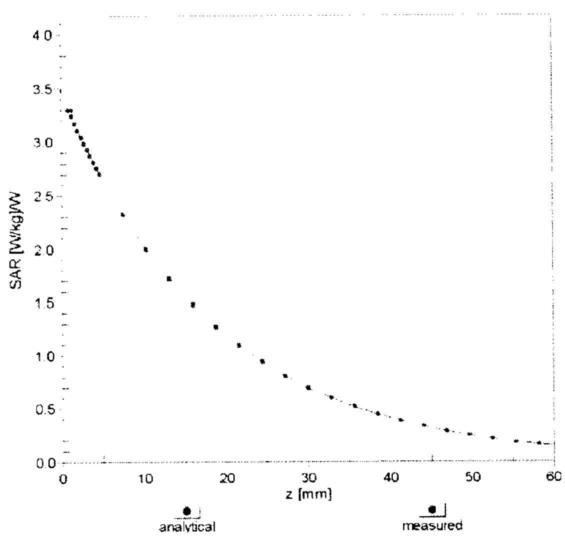
Dynamic Range f(SAR_{head})
(TEM cell , f_{eval}= 1900 MHz)

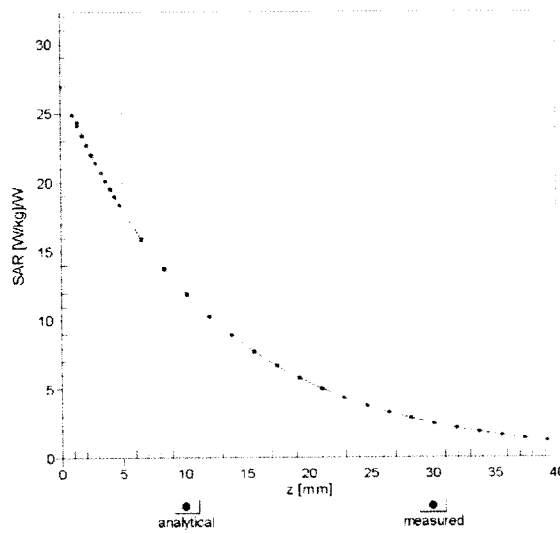




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

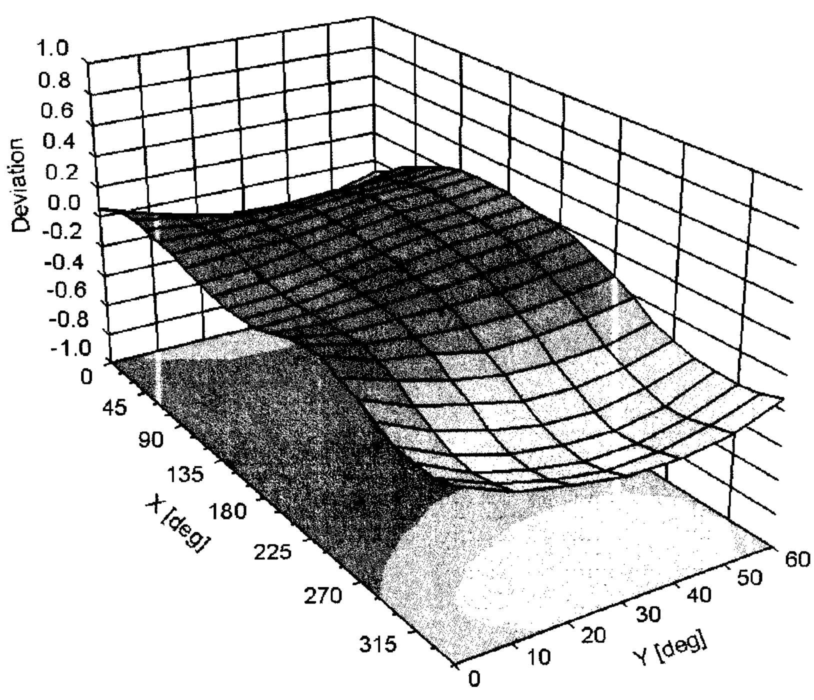
Conversion Factor Assessment

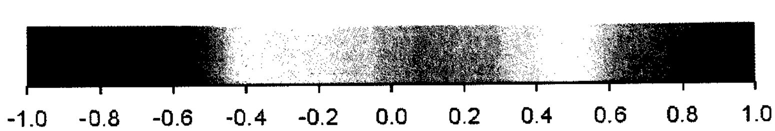




Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3833

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	14.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Appendix E – Dipole Calibration Data Sheets

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

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S **Servizio svizzero di taratura**
Swiss Calibration Service

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Accreditation No.: SCS 0108

Client **RF Exposure Lab**

Certificate No: D750V3-1053_Aug15

CALIBRATION CERTIFICATE

Object	D750V3 - SN: 1053
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	August 10, 2015

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 EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

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

Issued: August 12, 2015

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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.1 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.04 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.03 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.25 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	56.3 ± 6 %	1.00 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	2.18 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.48 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.43 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.59 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	54.4 Ω - 0.4 jΩ
Return Loss	- 27.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.5 Ω - 2.5 jΩ
Return Loss	- 32.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.035 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 08, 2011

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

D750V3 SN: 1053 - Head						
Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
8/10/205	-27.5		54.4		-0.4	
8/9/2016	-25.9	-5.8	54.3	-0.1	-0.5	-0.1

D750V3 SN: 1053 - Body						
Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
8/10/2015	-32.0		49.5		-2.5	
8/9/2016	-31.5	-1.6	51.0	1.5	-2.9	-0.4

DASY5 Validation Report for Head TSL

Date: 10.08.2015

Test Laboratory: SPEAG, Zurich, Switzerland

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

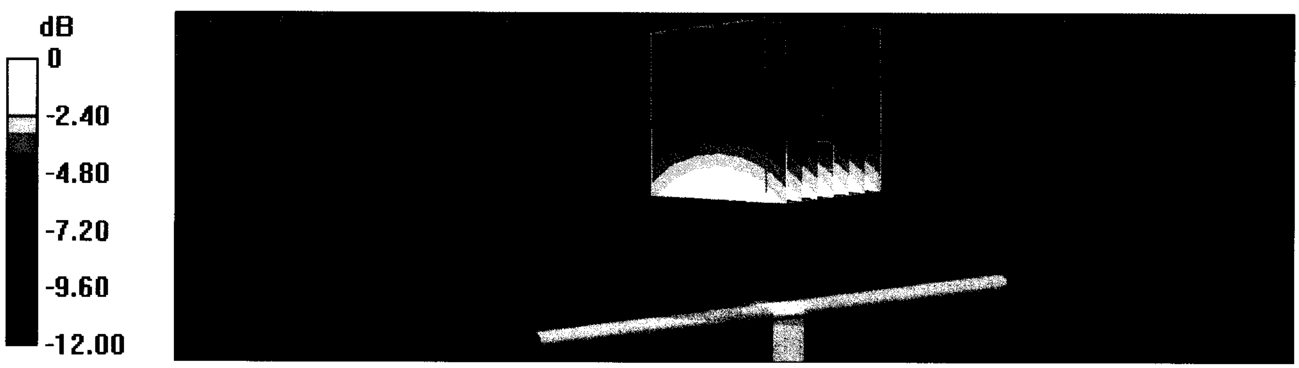
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.91 S/m; ε_r = 42.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.44, 6.44, 6.44); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

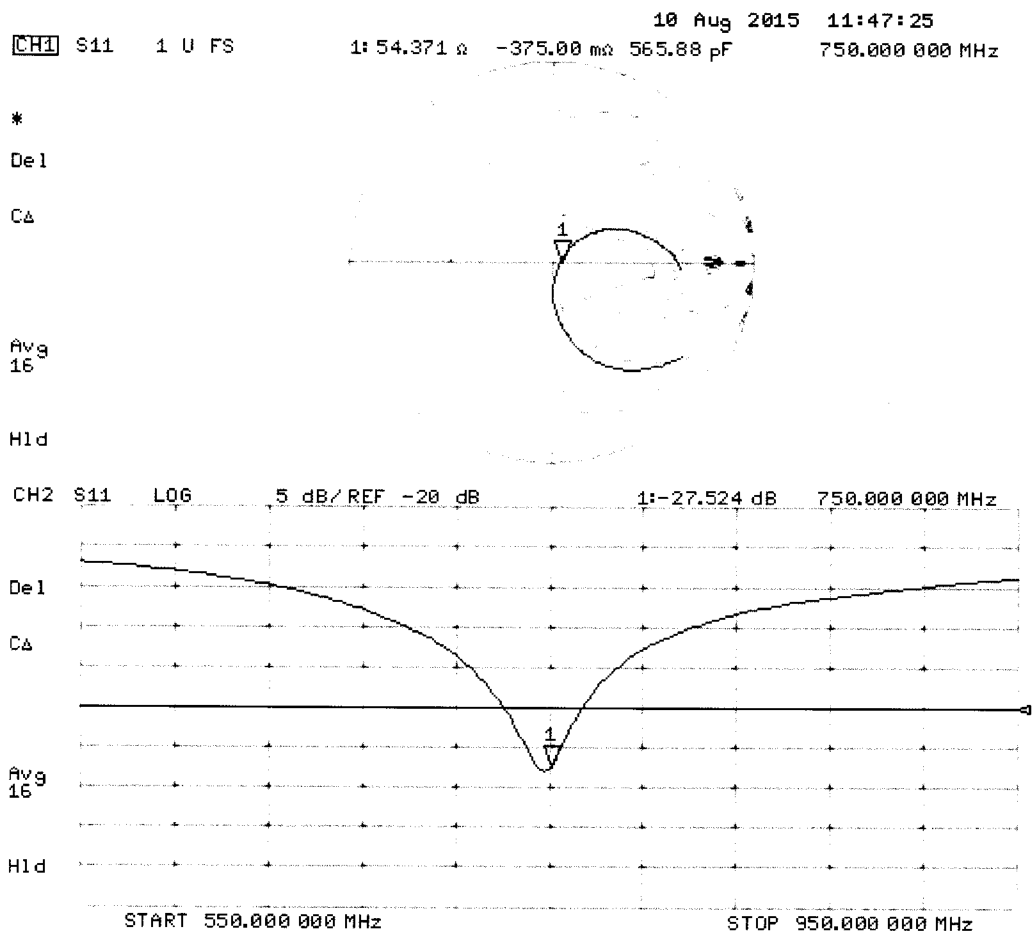
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.03 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.06 W/kg
SAR(1 g) = 2.04 W/kg; SAR(10 g) = 1.33 W/kg
Maximum value of SAR (measured) = 2.39 W/kg



0 dB = 2.39 W/kg = 3.78 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 10.08.2015

Test Laboratory: SPEAG, Zurich, Switzerland

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

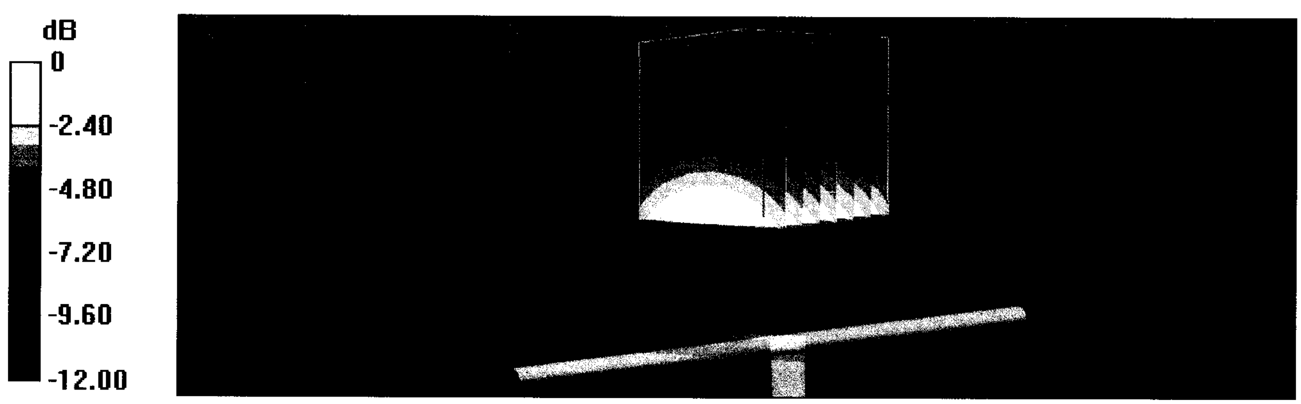
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma = 1$ S/m; $\varepsilon_r = 56.3$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.21, 6.21, 6.21); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

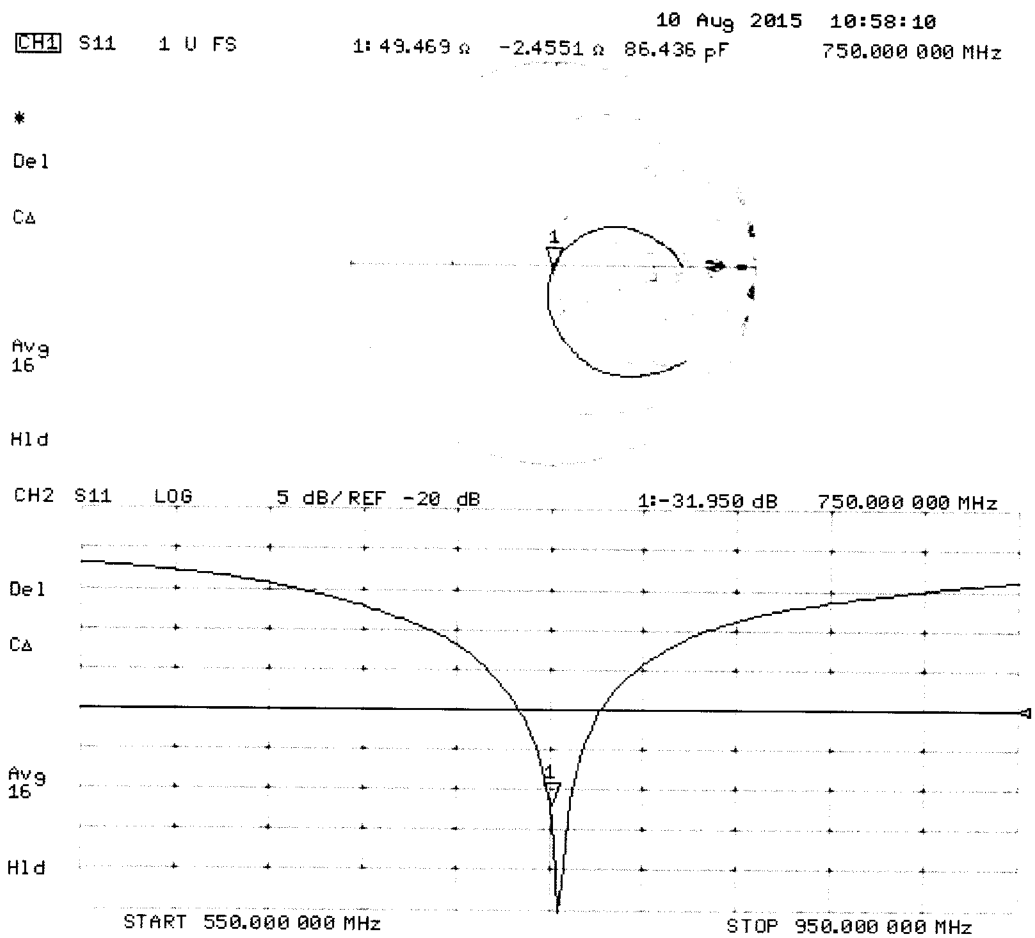
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.22 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 3.19 W/kg
SAR(1 g) = 2.18 W/kg; SAR(10 g) = 1.43 W/kg
Maximum value of SAR (measured) = 2.55 W/kg



0 dB = 2.55 W/kg = 4.07 dBW/kg

Impedance Measurement Plot for Body TSL



gm

Calibration Laboratory of
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Accreditation No.: SCS 0108

Client **RF Exposure Lab**

Certificate No: D835V2-4d131_Aug15

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d131
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	August 10, 2015

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 EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

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

Issued: August 12, 2015

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

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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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 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	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.9 ± 6 %	0.93 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	2.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.23 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.01 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	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	56.1 ± 6 %	1.02 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	2.40 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.28 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.57 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.11 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	52.3 Ω - 1.6 jΩ
Return Loss	- 31.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.7 Ω - 3.8 jΩ
Return Loss	- 26.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.394 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	July 22, 2011

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.

D835V2 SN: 4d131 - Head

Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
8/10/2015	-31.2		52.3		-1.6	
8/9/2016	-29.2	-6.4	51.3	-1.0	-1.8	-0.2

D835V2 SN: 4d131 - Body

Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
8/10/2015	-26.8		47.7		-3.8	
8/9/2016	-28.5	6.3	51.2	3.5	-3.8	0.0

DASY5 Validation Report for Head TSL

Date: 10.08.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d131

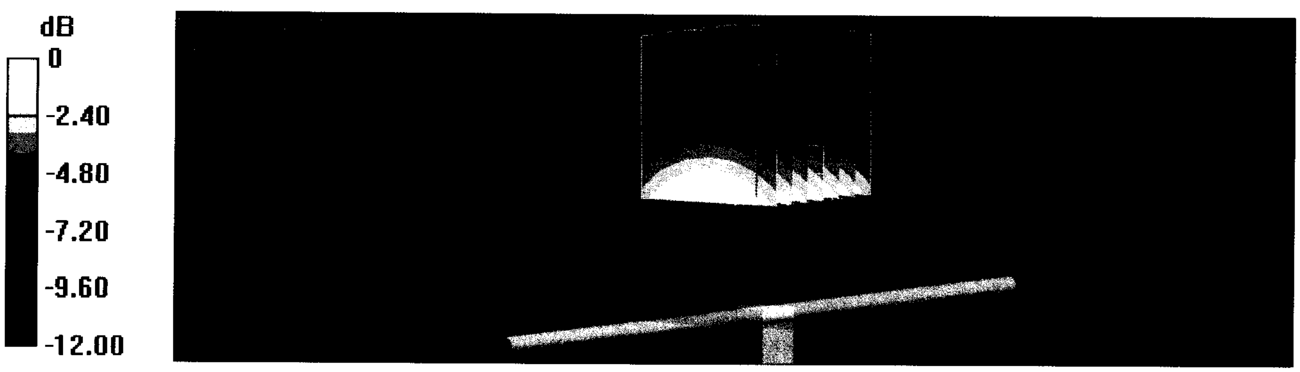
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.93 S/m; ε_r = 41.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.2, 6.2, 6.2); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

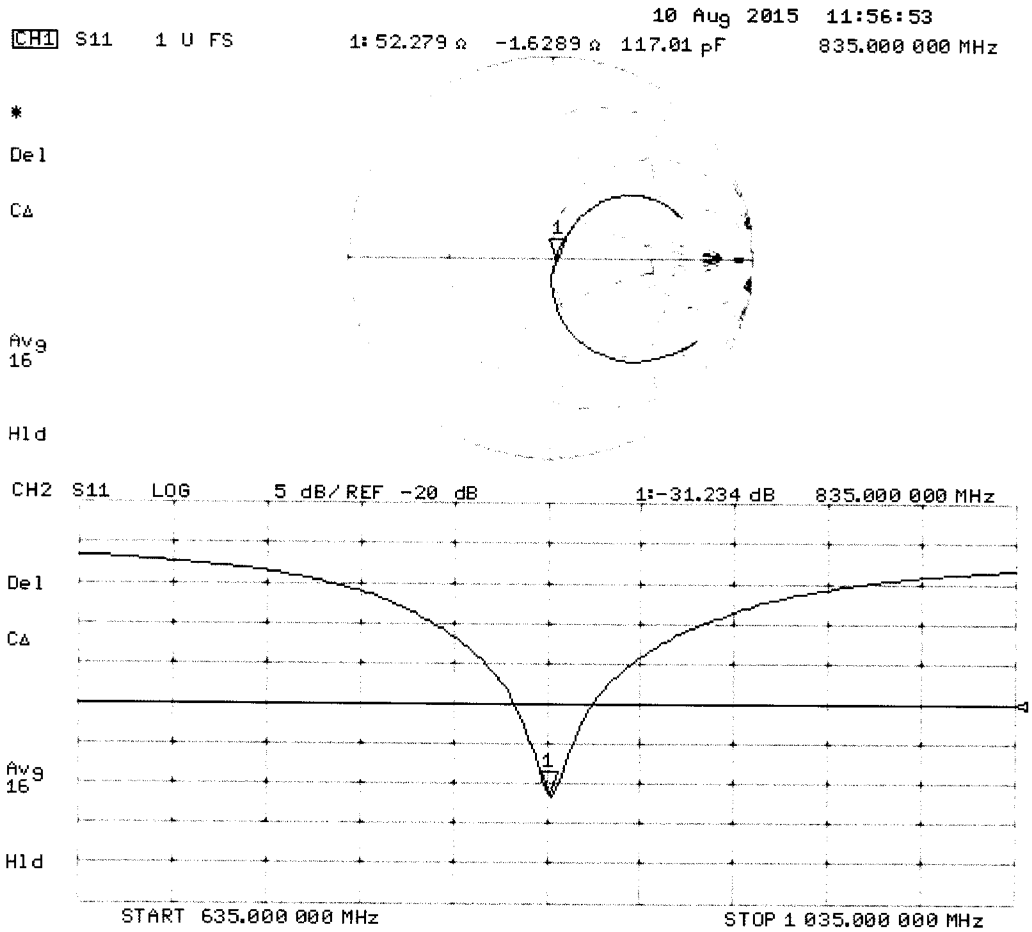
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.25 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.53 W/kg
SAR(1 g) = 2.36 W/kg; SAR(10 g) = 1.53 W/kg
Maximum value of SAR (measured) = 2.77 W/kg



0 dB = 2.77 W/kg = 4.42 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 10.08.2015

Test Laboratory: SPEAG, Zurich, Switzerland

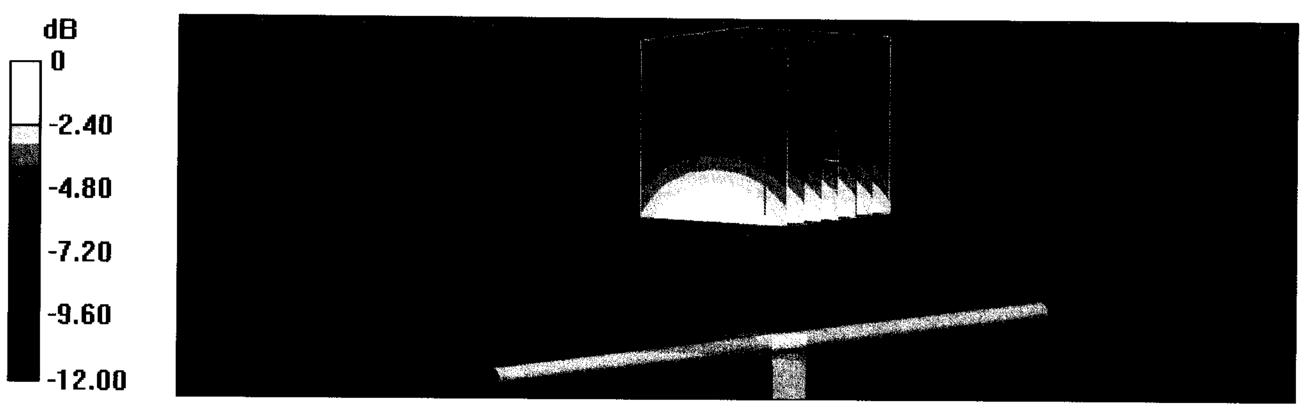
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d131

Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1.02 S/m; ε_r = 56.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

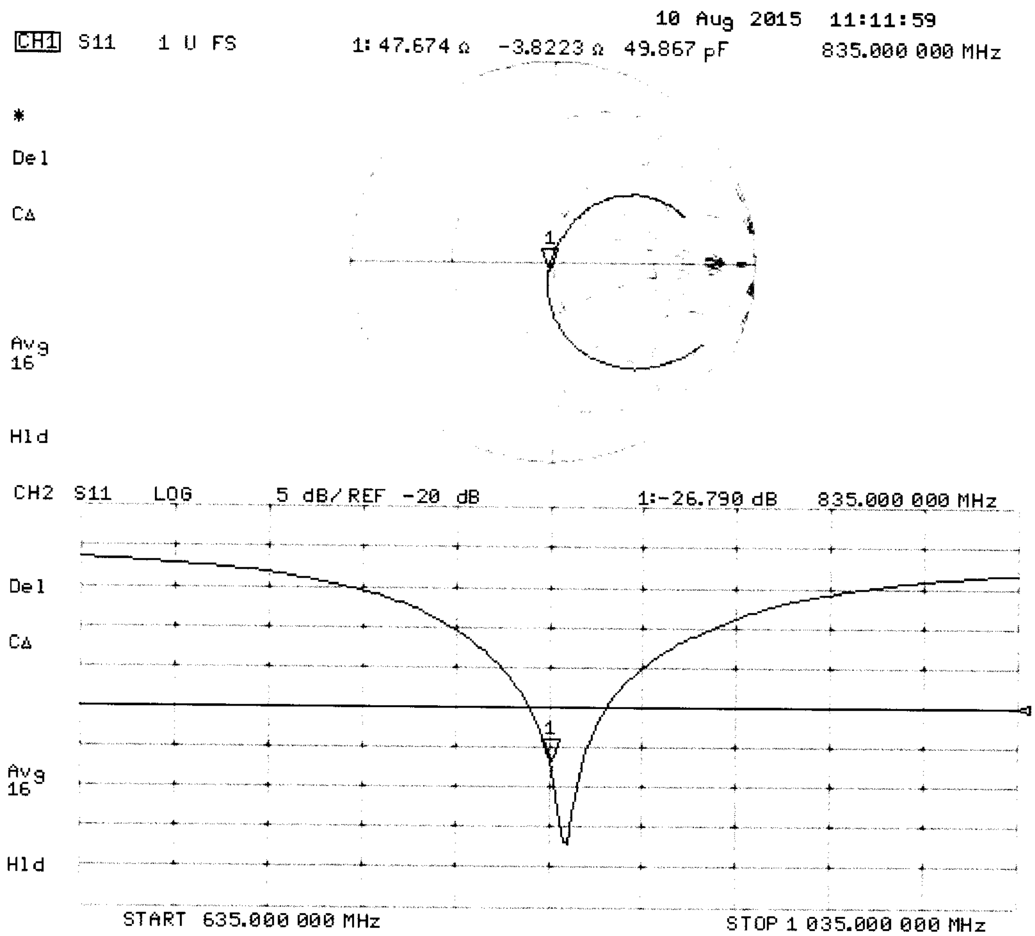
- Probe: ES3DV3 - SN3205; ConvF(6.17, 6.17, 6.17); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

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 = 54.25 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.51 W/kg
SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.57 W/kg
Maximum value of SAR (measured) = 2.80 W/kg



0 dB = 2.80 W/kg = 4.47 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client **RF Exposure Lab**

Certificate No: D1750V2-1061_Aug15

CALIBRATION CERTIFICATE

Object	D1750V2 - SN:1061
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	August 13, 2015

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 EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

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

Issued: August 13, 2015

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

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S **Swiss Calibration Service**

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

Accreditation No.: SCS 0108

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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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	V52.8.8
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	39.8 ± 6 %	1.36 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	9.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.90 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.6 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	52.1 ± 6 %	1.48 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	9.43 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**37.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.3 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	50.5 Ω + 1.2 jΩ
Return Loss	- 37.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.3 Ω + 0.8 jΩ
Return Loss	- 30.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.220 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	June 15, 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.

D1750V2 SN: 1061 - Head						
Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
8/13/2015	-37.8		50.5		1.2	
8/12/2016	-39.4	4.2	49.2	-1.3	0.7	-0.5

D1750V2 SN: 1061 - Body						
Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
8/13/2015	-30.7		47.3		0.8	
8/12/2016	-29.4	-4.2	46.1	-1.2	0.6	-0.2

DASY5 Validation Report for Head TSL

Date: 13.08.2015

Test Laboratory: SPEAG, Zurich, Switzerland

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

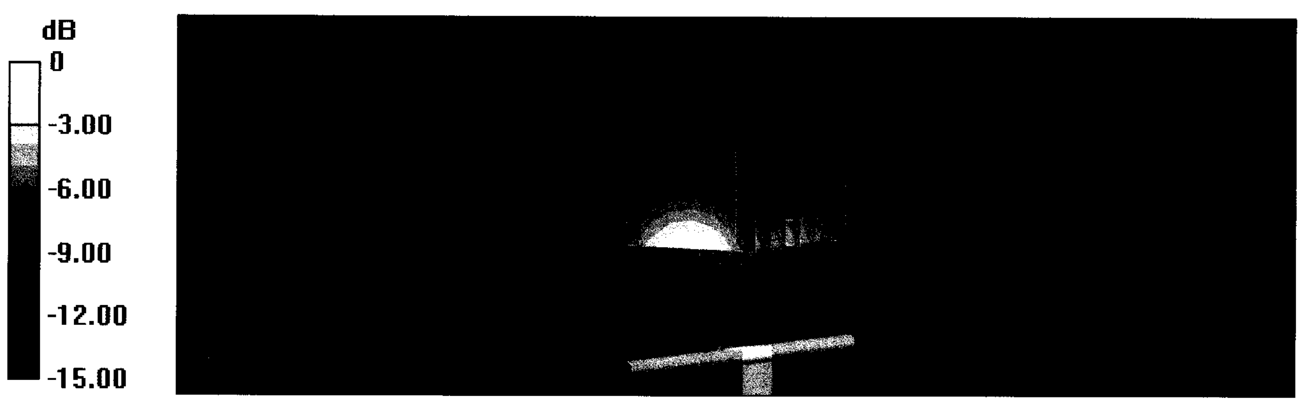
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.36 S/m; ε_r = 39.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.2, 5.2, 5.2); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

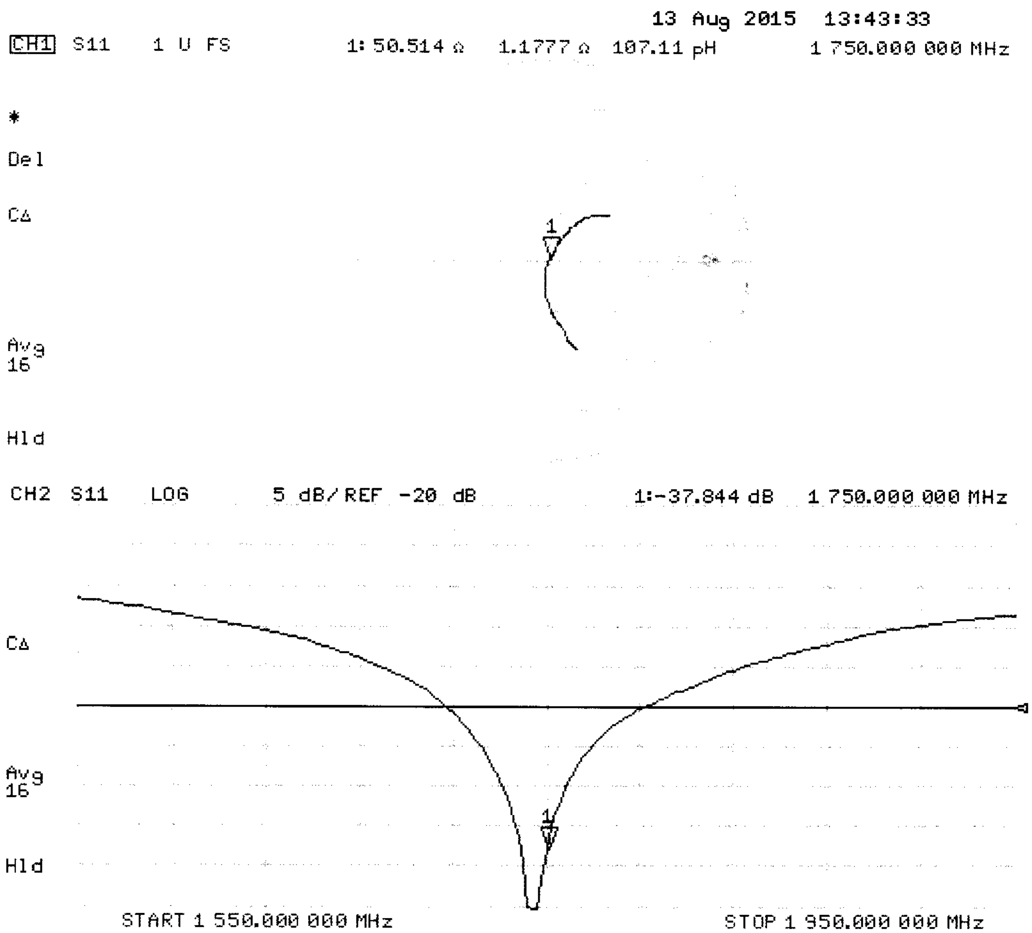
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.55 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 16.4 W/kg
SAR(1 g) = 9.18 W/kg; SAR(10 g) = 4.9 W/kg
Maximum value of SAR (measured) = 11.6 W/kg



0 dB = 11.6 W/kg = 10.64 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 13.08.2015

Test Laboratory: SPEAG, Zurich, Switzerland

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

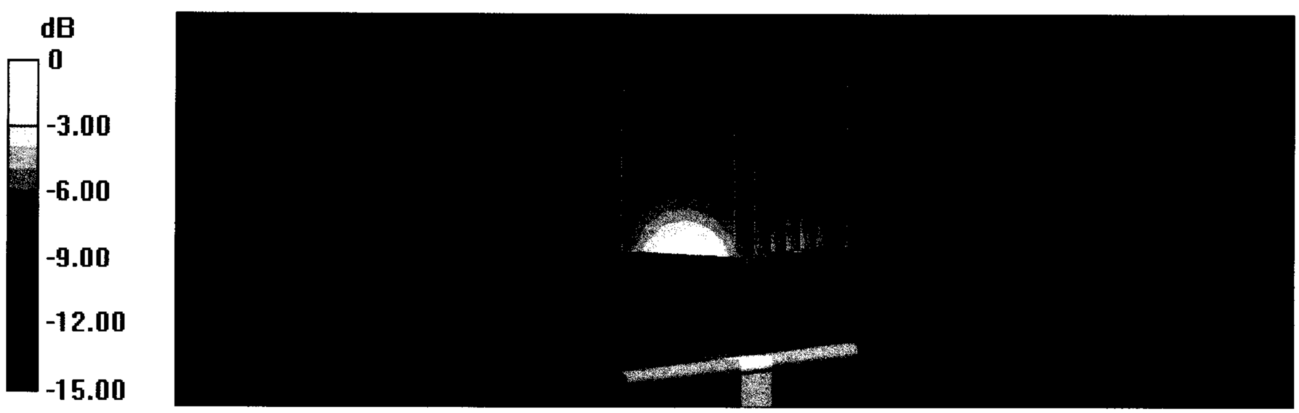
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.48 S/m; ε_r = 52.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.88, 4.88, 4.88); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

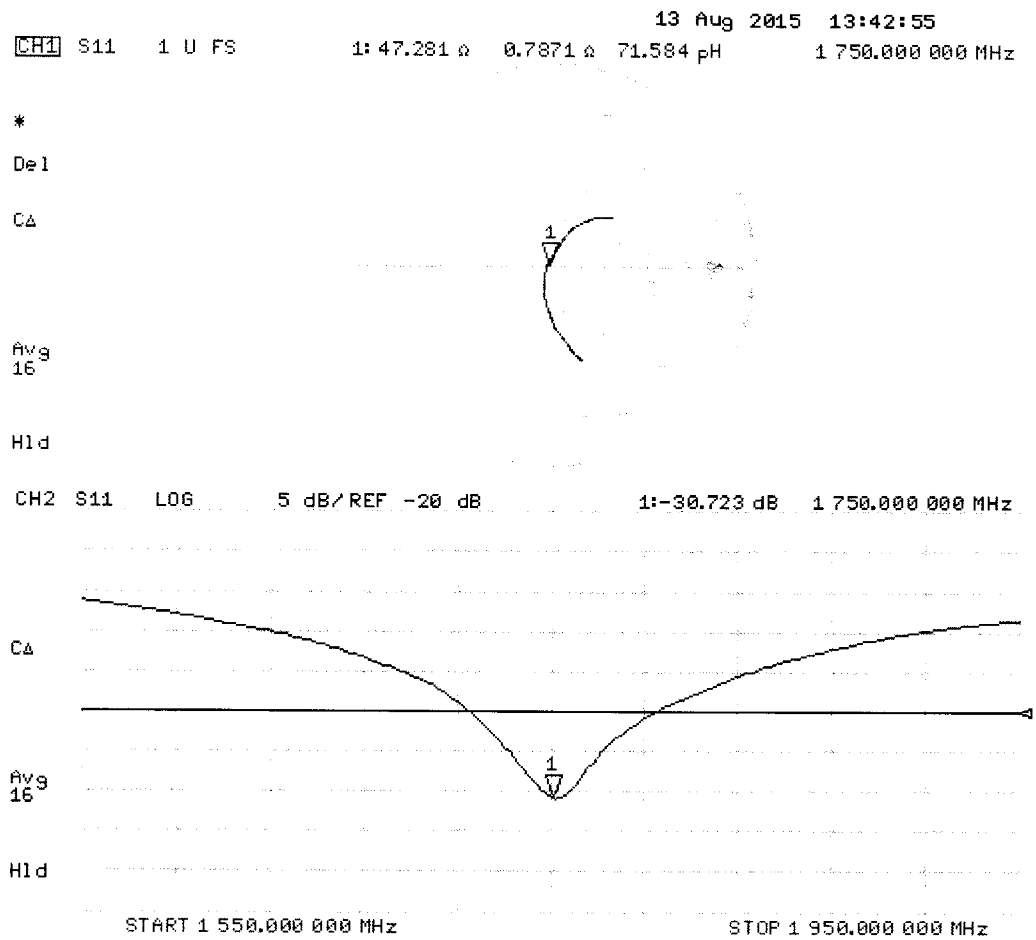
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.33 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 16.1 W/kg
SAR(1 g) = 9.43 W/kg; SAR(10 g) = 5.09 W/kg
Maximum value of SAR (measured) = 11.8 W/kg



0 dB = 11.8 W/kg = 10.72 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client **RF Exposure Lab**

Certificate No: D1900V2-5d147_Aug15

CALIBRATION CERTIFICATE

Object: D1900V2 - SN:5d147

Calibration procedure(s): QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: August 13, 2015

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 EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

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

Issued: August 13, 2015

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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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	V52.8.8
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	38.9 ± 6 %	1.39 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**41.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.47 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.8 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	52.5 ± 6 %	1.51 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	10.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**40.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.37 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.5 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	53.1 Ω + 6.2 jΩ
Return Loss	- 23.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.9 Ω + 6.5 jΩ
Return Loss	- 23.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.193 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 11, 2011

Extended Calibration

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

D1900V2 SN: 5d147 - Head

Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
8/13/2015	-23.5		53.1		6.2	
8/12/2016	-24.9	6.0	53.9	0.8	5.4	-0.8

D1900V2 SN: 5d147 - Body

Date of Measurement	Return Loss (dB)	Δ%	Impedance Real (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
8/13/2015	-23.5		48.9		6.5	
8/12/2016	-22.8	-3.0	46.3	-2.6	6.9	0.4

DASY5 Validation Report for Head TSL

Date: 13.08.2015

Test Laboratory: SPEAG, Zurich, Switzerland

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

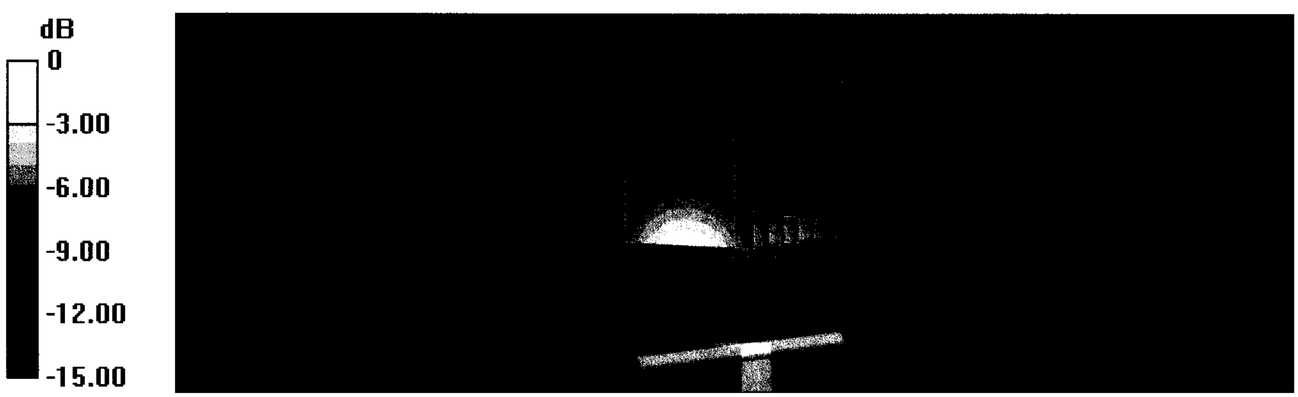
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma = 1.39$ S/m; $\varepsilon_r = 38.9$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5, 5, 5); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

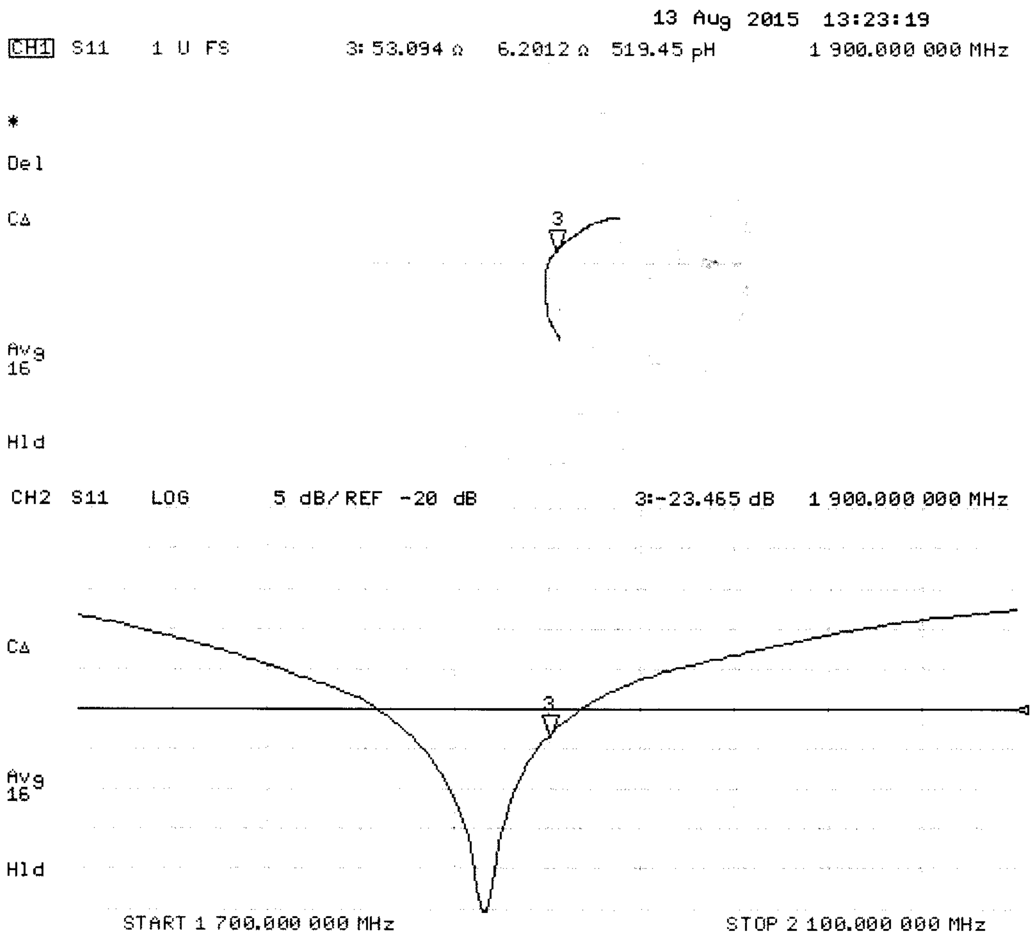
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 100.3 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 19.0 W/kg
SAR(1 g) = 10.4 W/kg; SAR(10 g) = 5.47 W/kg
Maximum value of SAR (measured) = 13.2 W/kg



0 dB = 13.2 W/kg = 11.21 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 13.08.2015

Test Laboratory: SPEAG, Zurich, Switzerland

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

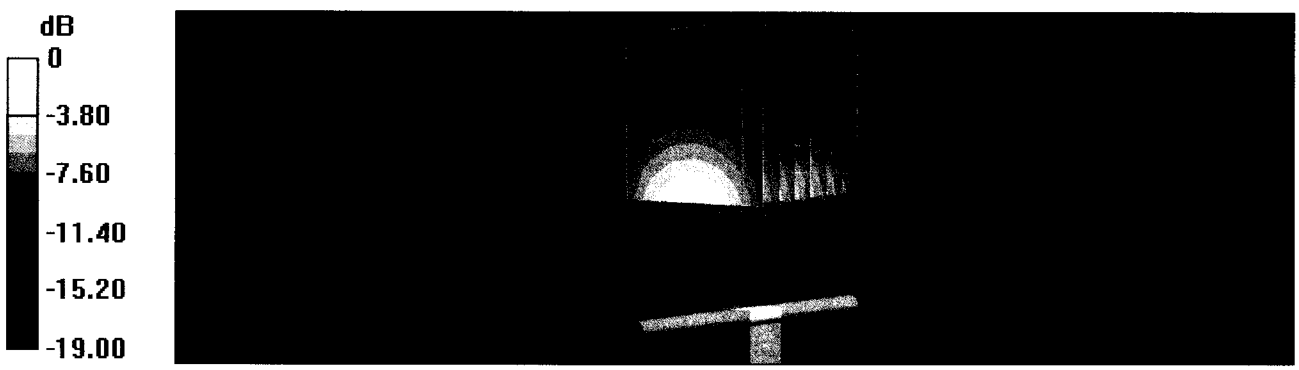
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.51 S/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.65, 4.65, 4.65); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

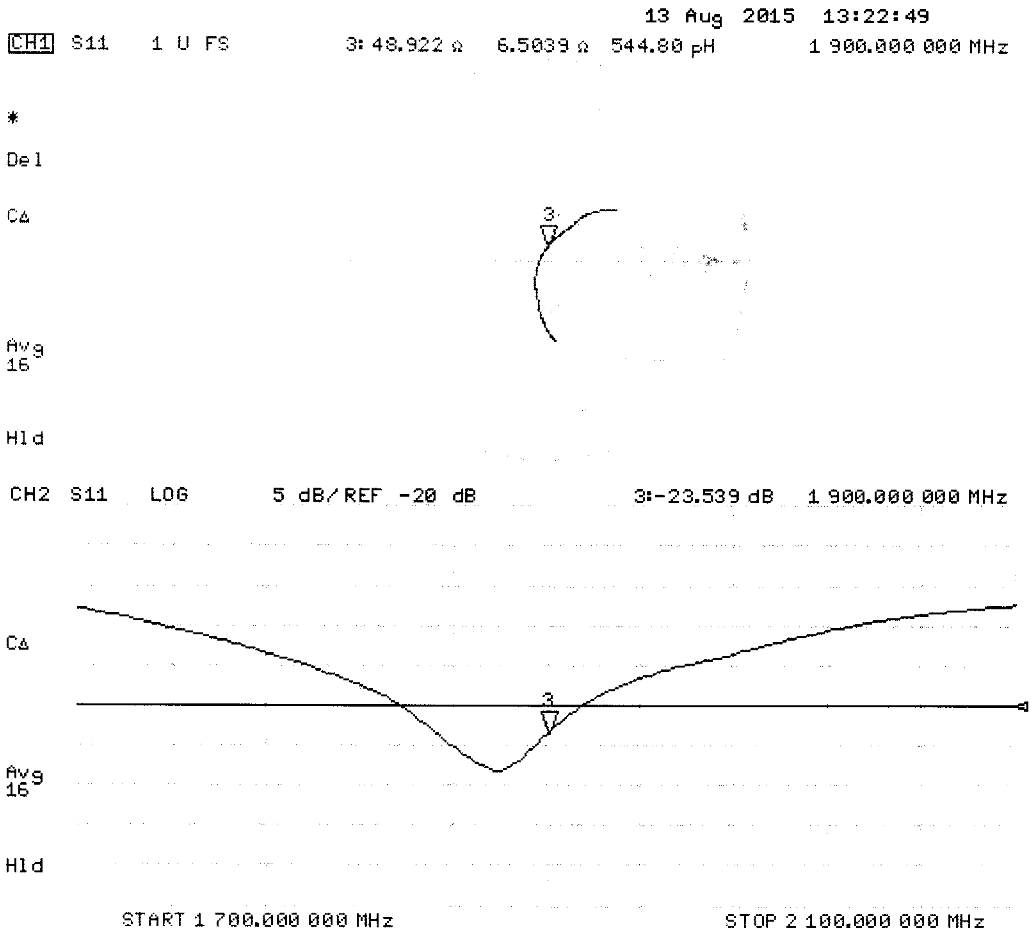
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.00 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.37 W/kg
Maximum value of SAR (measured) = 12.8 W/kg



0 dB = 12.8 W/kg = 11.07 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**
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S	**Swiss Calibration Service**

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

Accreditation No.: SCS 0108

Client **RF Exposure Lab**

Certificate No: D2300V2-1060_Sep15

CALIBRATION CERTIFICATE

Object	D2300V2 - SN: 1060
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	September 17, 2015

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 EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe EX3DV4	SN: 7349	30-Dec-14 (No. EX3-7349_Dec14)	Dec-15
DAE4	SN: 601	17-Aug-15 (No. DAE4-601_Aug15)	Aug-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100972	15-Jun-15 (in house check Jun-15)	In house check: Jun-18
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Israe Elnaouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 17, 2015

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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2300 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.5	1.67 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.7 ± 6 %	1.69 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	12.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**48.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.79 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.1 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	52.9	1.81 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.6 ± 6 %	1.84 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	12.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**48.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.83 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.3 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	48.4 Ω - 3.8 jΩ
Return Loss	- 27.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	44.3 Ω - 3.1 jΩ
Return Loss	- 23.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.170 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 20, 2015

DASY5 Validation Report for Head TSL

Date: 08.09.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN: 1060

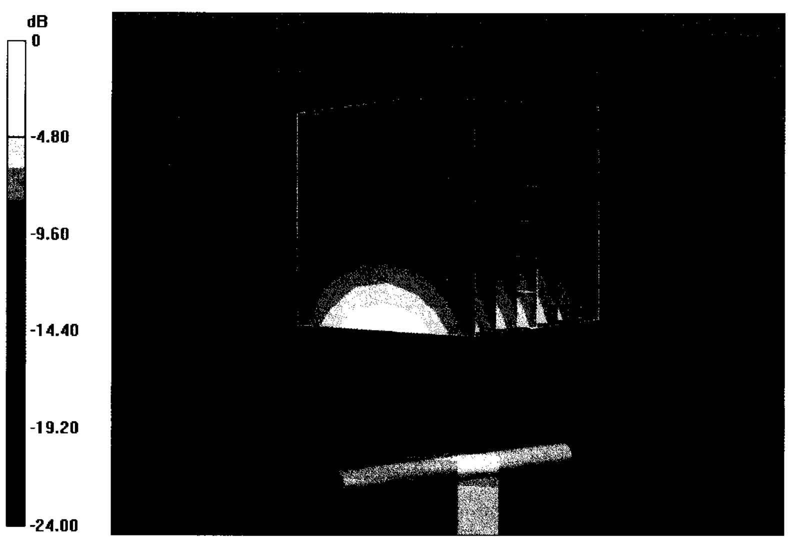
Communication System: UID 0 - CW; Frequency: 2300 MHz
Medium parameters used: f = 2300 MHz; σ = 1.69 S/m; ε_r = 39.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.94, 7.94, 7.94); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

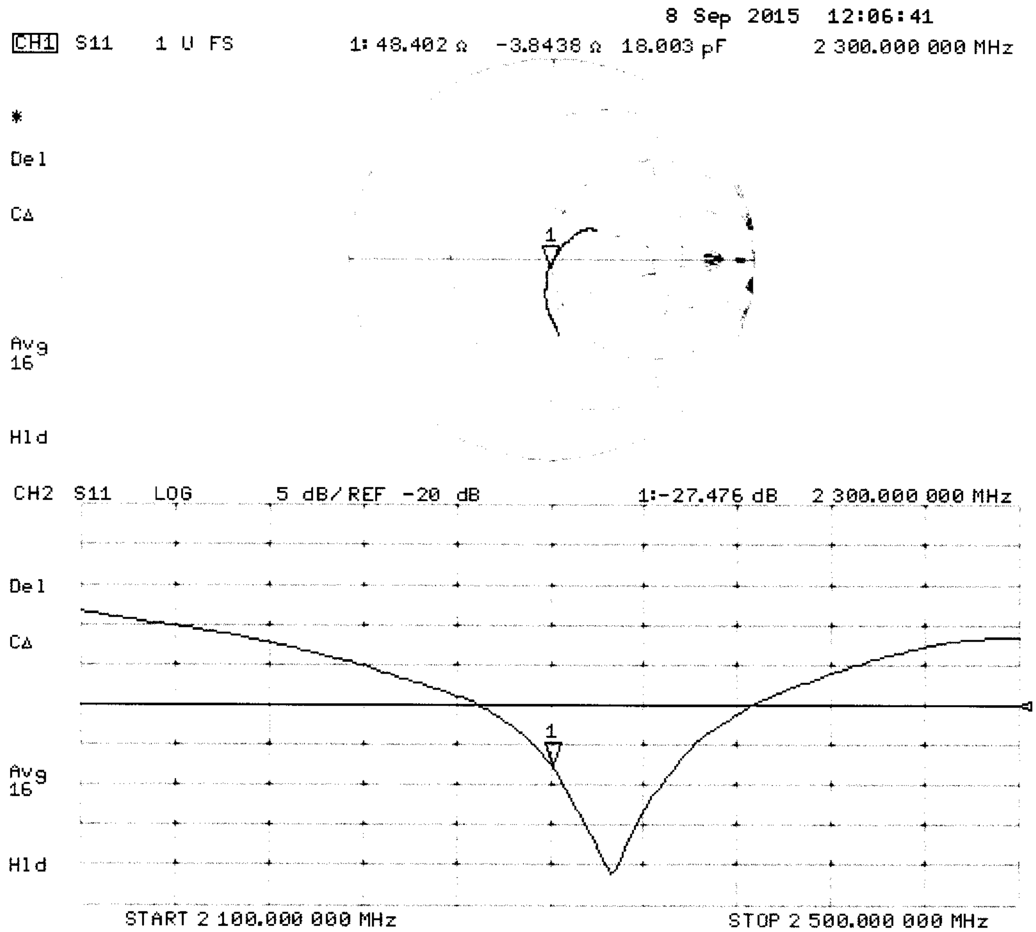
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 112.1 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 23.9 W/kg
SAR(1 g) = 12.1 W/kg; SAR(10 g) = 5.79 W/kg
Maximum value of SAR (measured) = 19.7 W/kg



0 dB = 19.7 W/kg = 12.94 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 17.09.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN: 1060

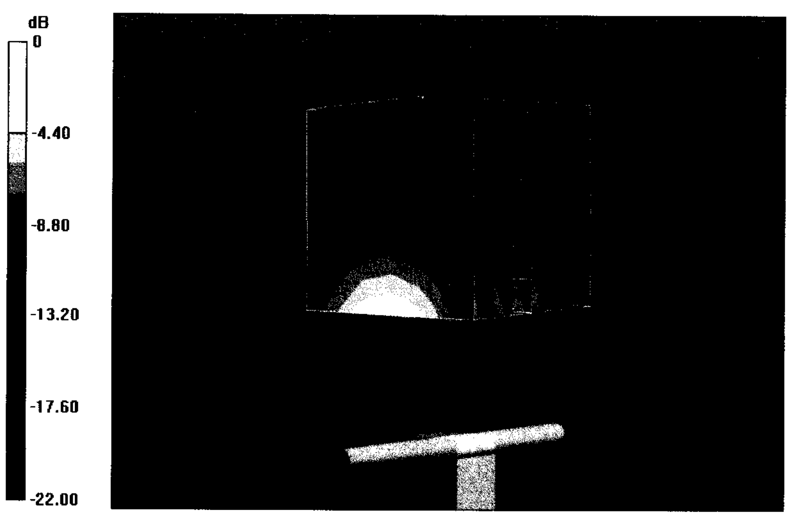
Communication System: UID 0 - CW; Frequency: 2300 MHz
Medium parameters used: f = 2300 MHz; σ = 1.84 S/m; ε_r = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.66, 7.66, 7.66); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

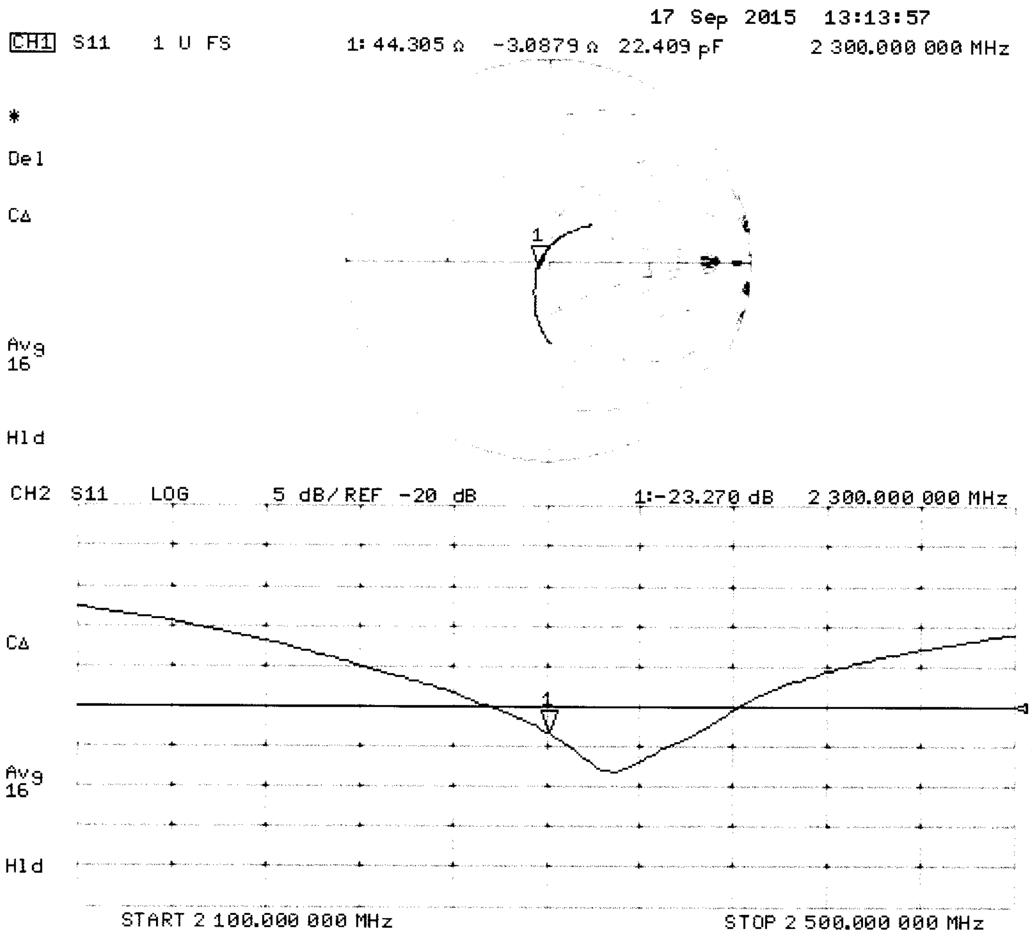
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 106.2 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 23.5 W/kg
SAR(1 g) = 12.1 W/kg; SAR(10 g) = 5.83 W/kg
Maximum value of SAR (measured) = 19.3 W/kg



0 dB = 19.3 W/kg = 12.86 dBW/kg

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
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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

Client **RF Exposure Lab**

Certificate No: D2550V2-1003_Aug15

CALIBRATION CERTIFICATE

Object	D2550V2 - SN: 1003
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	August 10, 2015

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 EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

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

Issued: August 12, 2015

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

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2550 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.1	1.91 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.8 ± 6 %	1.97 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**56.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.43 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.8 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	52.6	2.09 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.3 ± 6 %	2.14 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	14.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**54.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.38 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**25.2 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	49.6 Ω - 1.3 jΩ
Return Loss	- 37.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.8 Ω - 1.2 jΩ
Return Loss	- 29.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.155 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	April 01, 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.

D2550V2 SN: 1003 - Head						
Date of Measurement	Return Loss (dB)	Δ%	Impedance (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
8/10/2015	-37.2		49.6		-1.3	
8/9/2016	-35.9	-3.5	48.2	-1.4	-1.6	-0.3

D2550V2 SN: 1003 - Body						
Date of Measurement	Return Loss (dB)	Δ%	Impedance (Ω)	ΔΩ	Impedance Imaginary (jΩ)	ΔΩ
8/10/2015	-29.0		46.8		-1.2	
8/9/2016	-29.1	0.3	45.1	-1.7	-1.8	-0.6

Date: 10.08.2015

Test Laboratory: SPEAG, Zurich, Switzerland

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

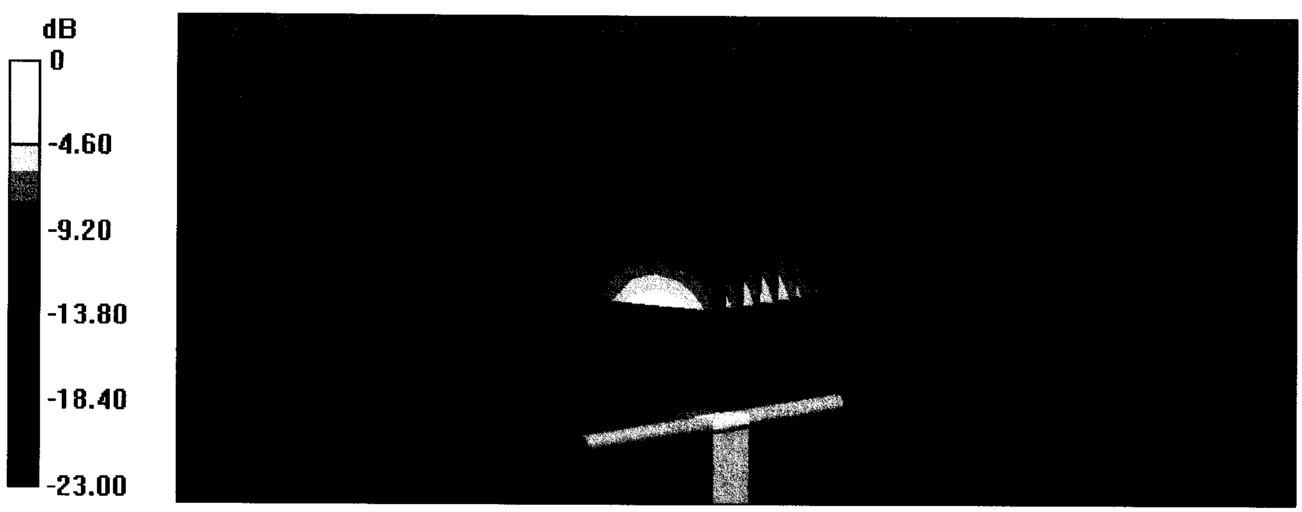
Communication System: UID 0 - CW; Frequency: 2550 MHz
Medium parameters used: f = 2550 MHz; σ = 1.95 S/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

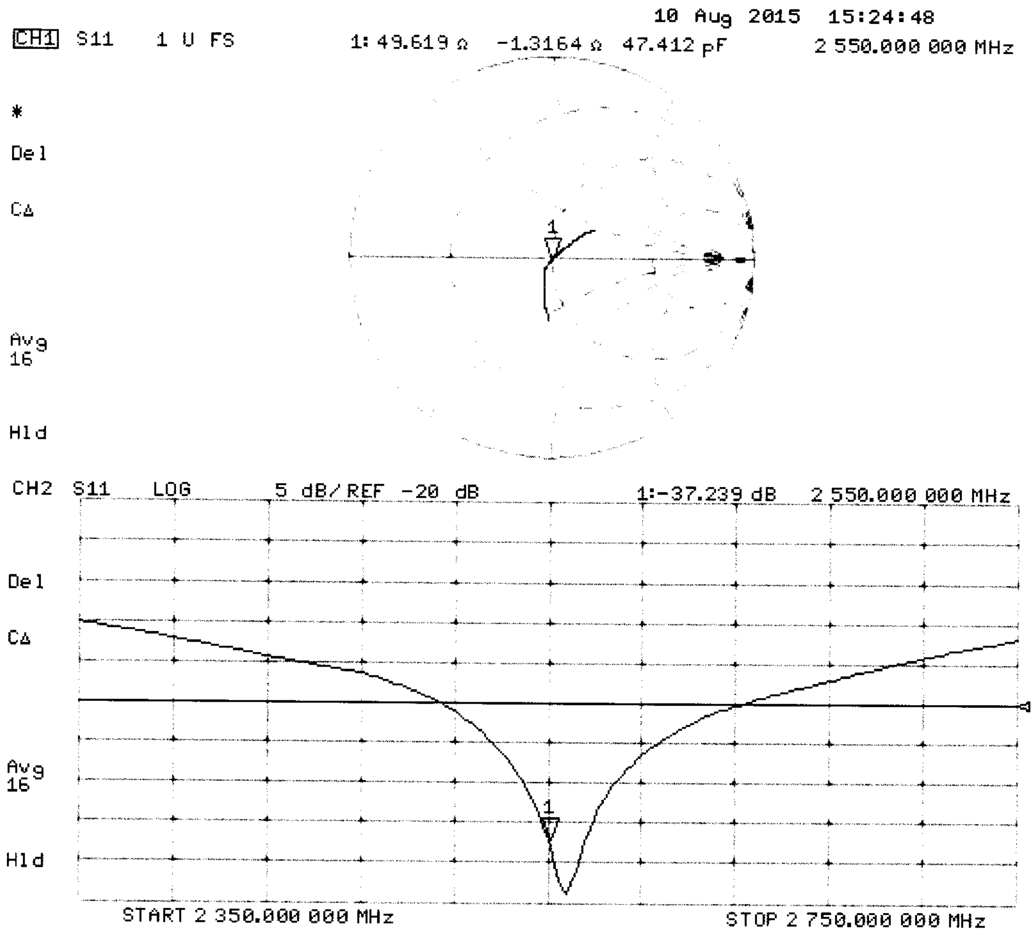
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 102.1 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 28.8 W/kg
SAR(1 g) = 14.1 W/kg; SAR(10 g) = 6.43 W/kg
Maximum value of SAR (measured) = 18.7 W/kg



0 dB = 18.7 W/kg = 12.72 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 10.08.2015

Test Laboratory: SPEAG, Zurich, Switzerland

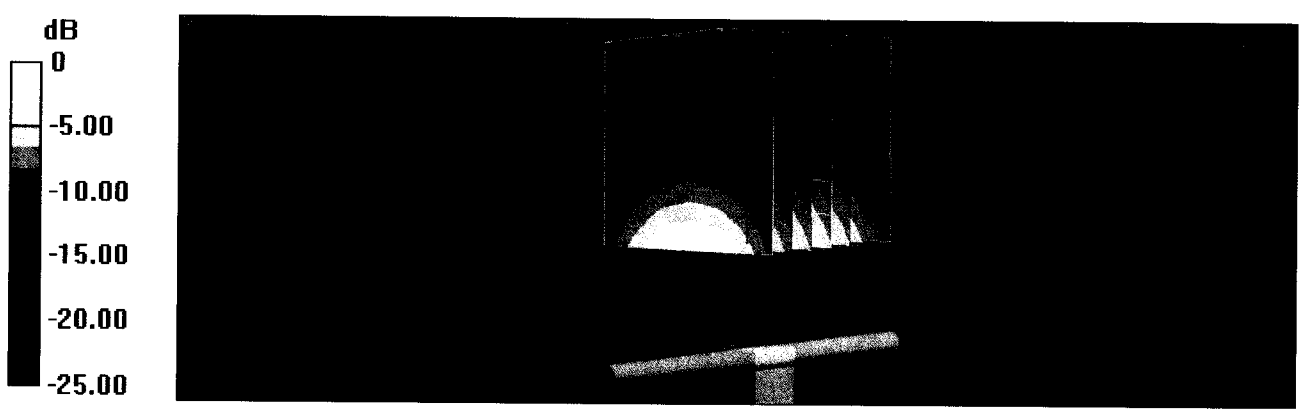
DUT: Dipole 2550 MHz; Type: D2550V2; Serial: D2550V2 - SN: 1003

Communication System: UID 0 - CW; Frequency: 2550 MHz
Medium parameters used: f = 2550 MHz; σ = 2.14 S/m; ε_r = 50.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

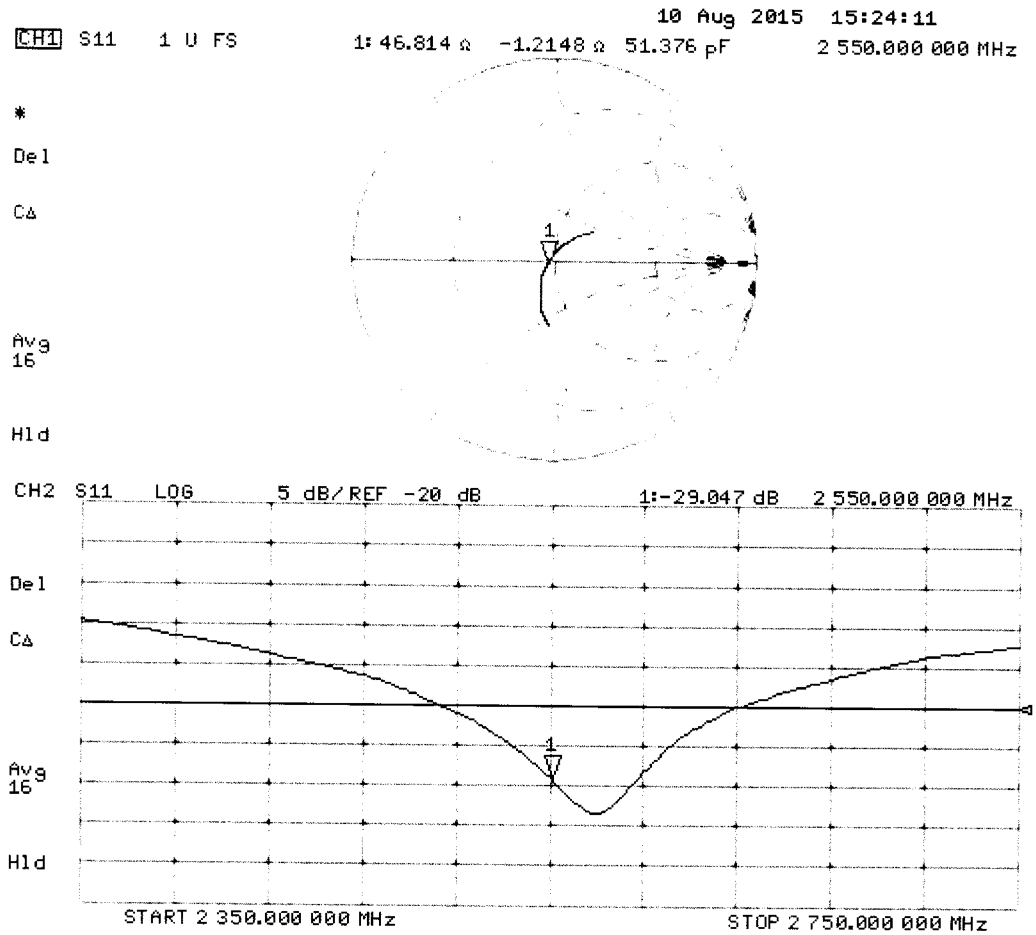
- Probe: ES3DV3 - SN3205; ConvF(4.2, 4.2, 4.2); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

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 = 96.70 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 29.1 W/kg
SAR(1 g) = 14 W/kg; SAR(10 g) = 6.38 W/kg
Maximum value of SAR (measured) = 18.5 W/kg



0 dB = 18.5 W/kg = 12.67 dBW/kg

Impedance Measurement Plot for Body TSL



Appendix F – Phantom Calibration Data Sheets

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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