CESAR REPORT

Applicant:	Shenzhen Huafurui Technology Co., Ltd
Address of Applicant:	Unit 1401 &1402, 14/F, Jinqi zhigu mansion (No. 4 building of Chong wen Garden), Crossing of the Liu xian street and Tang ling road, Tao yuan street, Nan shan district, Shenzhen,P.R. China
Equipment Under Test (EUT)	
Product Name:	Smart Phone
Model No.:	KINGKONG MINI
Trade mark:	CUBOT
Applicable standards:	EN 50360:2017, EN 50566:2017 EN 62209-1:2016, EN 62209-2:2010 EN 50663:2017,EN 62479:2010
Date of sample receipt:	23 Sep., 2019
Date of Test:	09 Oct., 2019~ 21 Oct., 2019
Date of report issued:	24 Oct., 2019
Test Result:	Maximum 10g SAR Head: 0.445 W/kg Body: 1.675 W/kg

Authorized Signature:

ZHONGJIAN NANFANG TESTING CO.,LTD SHENZHEN CCIS

Bruce Zhang
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the CCIS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

2 Version

Version No.	Date	Description
00	22 Oct., 2019	Original
01	24 Oct., 2019	1. updated the hardware version on page 6. 2. updated the test instruments list on page 17. 3. updated the Bluetooth EIRP Power on page 7/32.

Tested by: Huheng Cai **Date:** 24 Oct., 2019

Test Engineer

Reviewed by: Janet Wei **Date:** 24 Oct., 2019

Project Engineer

3 Contents

4 SAR Results Summary

The maximum results of Specific Absorption Rate (SAR) found during test as bellows:

<Highest Reported standalone SAR Summary>

Exposure Position	Frequency Band	Reported 10-g SAR(W/kg)	Equipment Class	Highest Reported 10-g SAR (W/kg)
Head	GSM 900	0.420	PCE	0.445
	DCS1800	0.246		
	WCDMA Band I	0.128		
	WCDMA Band V III	0.397		
	LTE Band 1	0.082		
	LTE Band 3	0.303		
	LTE Band 7	0.098		
	LTE Band 8	0.445		
	LTE Band 20	0.249		
	WLAN 2.4GHz	0.100	DTS	
Body (5 mm Gap)	GSM 900	1.675	PCE	1.675
	DCS1800	1.240		
	WCDMA Band I	0.220		
	WCDMA Band V III	0.598		
	LTE Band 1	0.230		
	LTE Band 3	0.730		
	LTE Band 7	0.340		
	LTE Band 8	0.475		
	LTE Band 20	0.386		
	WLAN 2.4GHz	0.054	DTS	

<Highest Reported simultaneous SAR Summary>

Exposure Position	Frequency Band	Reported 10-g SAR (W/kg)	Equipment Class	Highest Reported Simultaneous Transmission 10-g SAR (W/kg)
Back	GPRS 900 4Slots	1.675	PCE	1.729
	WLAN 2.4GHz	0.054	DTS	

Note:

1. This device is compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (2.0W/kg for distance 5mm) specified in EN 50360:2017 and EN 50566:2017, and had been tested in accordance with the measurement methods and procedures specified in EN 62209-1:2016 and EN 62209-2:2010.

5 General Information

5.1 Client Information

Applicant:	Shenzhen Huafurui Technology Co., Ltd.
Address of Applicant:	Unit 1401 &1402, 14/F, Jinqi zhigu mansion (No. 4 building of Chong wen Garden), Crossing of the Liu xian street and Tang ling road, Tao yuan street, Nan shan district, Shenzhen,P.R. China
Manufacturer:	Shenzhen Huafurui Technology Co., Ltd.
Address of Manufacturer:	Unit 1401 &1402, 14/F, Jinqi zhigu mansion (No. 4 building of Chong wen Garden), Crossing of the Liu xian street and Tang ling road, Tao yuan street, Nan shan district, Shenzhen,P.R. China
Factory:	Shenzhen Huafurui Technology Co., Ltd.
Address of Factory:	Unit 1401 &1402, 14/F, Jinqi zhigu mansion (No. 4 building of Chong wen Garden), Crossing of the Liu xian street and Tang ling road, Tao yuan street, Nan shan district, Shenzhen,P.R. China

5.2 General Description of EUT

Product Name:	Smart Phone		
Model No.:	KINGKONG MINI		
Hardware Version:	D936_MB_V2.0_20190817		
Software Version:	CUBOT_KINGKONG MINI_9101C_V01_20190814		
Category of device	Portable device		
Operation Frequency:	GSM 900:880 MHz ~ 915 MHz DCS 1800:1710 MHz ~ 1785 MHz WCDMA Band I: 1920 MHz ~1970 MHz WCDMA BandVIII :880MHz~915MHz FDD LTE Band 1 :1920MHz~1980MHz FDD LTE Band 3 :1710MHz~1785MHz FDD LTE Band 7 :2500MHz~2570MHz FDD LTE Band 8 :880MHz~915MHz FDD LTE Band 20 :832MHz~862MHz WLAN: 802.11b/g/n-HT20:2412 MHz ~2472 MHz Bluetooth: 2402 MHz ~2480 MHz		
Modulation technology:	GSM/GPRS: GMSK, EGPRS: 8PSK, WCDMA: QPSK LTE:QPSK/16QAM, WLAN: 802.11b: DSSS, 802.11g/n: OFDM Bluetooth: GFSK /π/4DQPSK/8DPSK BLE: GFSK		
Antenna Type:	Internal		
(E)GPRS Class:	(E)GPRS: Class 12		
Dimensions (L*W*H):	119mm (L)× 59mm (W)× 12mm (H)		
Accessories information:	Adapter: Model No.:HJ-0501000B3-EU Input: AC100-240V, 50/60Hz 0.15 A Output: DC 5.0V, 1.0A	Battery: 3.7 V 2000mAh Rechargeable Li-ion Battery	Headset: Support (shipped without)

5.3 Maximum RF Output Power

Mode	Average Power (dBm)	
	GSM 900	DCS 1800
GSM (Voice)	32.62	29.25
GPRS (1 TX Slot)	32.60	29.24
GPRS (2 TX Slots)	31.78	28.30
GPRS (3 TX Slots)	30.82	26.82
GPRS (4 TX Slots)	29.89	25.86
EGPRS (1 TX Slot)	26.75	25.97
EGPRS (2 TX Slots)	24.78	24.12
EGPRS (3 TX Slots)	22.83	22.28
EGPRS (4 TX Slots)	20.94	20.51

Mode	Average Power (dBm)	
	WCDMA Band I	WCDMA Band VIII
RMC 12.2 kbps	22.13	22.15
HSDPA Sub-test 1	21.24	21.18
HSDPA Sub-test 2	20.64	20.73
HSDPA Sub-test 3	19.94	19.68
HSDPA Sub-test 4	19.72	19.79
HSUPA Sub-test 1	20.91	20.88
HSUPA Sub-test 2	21.25	21.15
HSUPA Sub-test 3	20.08	19.97
HSUPA Sub-test 4	21.30	21.20
HSUPA Sub-test 5	20.61	20.57

Mode	Average Power (dBm)				
	LTE Band 1	LTE Band 3	LTE Band 7	LTE Band 8	LTE Band 20
1.4 MHz	/	23.50	/	23.55	/
5 MHz	23.50	23.36	23.48	23.53	22.86
10 MHz	/	/	/	23.60	/
20 MHz	23.32	23.33	23.28	/	22.82

Mode	RF Output Power(dBm)
2.4GHz WIFI	15.08
Bluetooth	3.81

5.4 Environment of Test Site

Temperature:	18°C~25°C
Humidity:	35%~75% RH
Atmospheric Pressure:	1011 mbar

5.5 Test Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.
Address: No.B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road, Bao’an District, Shenzhen, Guangdong, China
Tel: +86-755-23118282, Fax: +86-755-23116366
E-mail: info@ccis-cb.com

6 Introduction

6.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

6.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$\text{SAR}=\frac{d}{dt}\left(\frac{dU}{dm}\right)=\frac{d}{dt}\left(\frac{dU}{\rho dv}\right)$$

SAR is expressed in units of Watts per kilogram (W/kg)
SAR measurement can be either related to the temperature elevation in tissue by

$$\text{SAR} = \text{C}\left(\frac{\delta T}{\delta t}\right)$$

Where: C is the specific heat capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

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

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength. However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

7 RF Exposure Limits

Limits for General Population/Uncontrolled Exposure (W/kg)

Type Exposure	Uncontrolled Environment Limit
Spatial Peak SAR (10g cube tissue for head and trunk)	2.00W/kg
Spatial Peak SAR (10g cube tissue for limbs)	4.00W/kg
Spatial Peak SAR (10g cube tissue for whole body)	0.08 W/kg

Note:

1. This limit is according to recommendation1999/519/EC, Annex II (Basic Restrictions)
2. Occupational/Uncontrolled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure,(i.e. as a result of employment or occupation)

8 SAR Measurement System

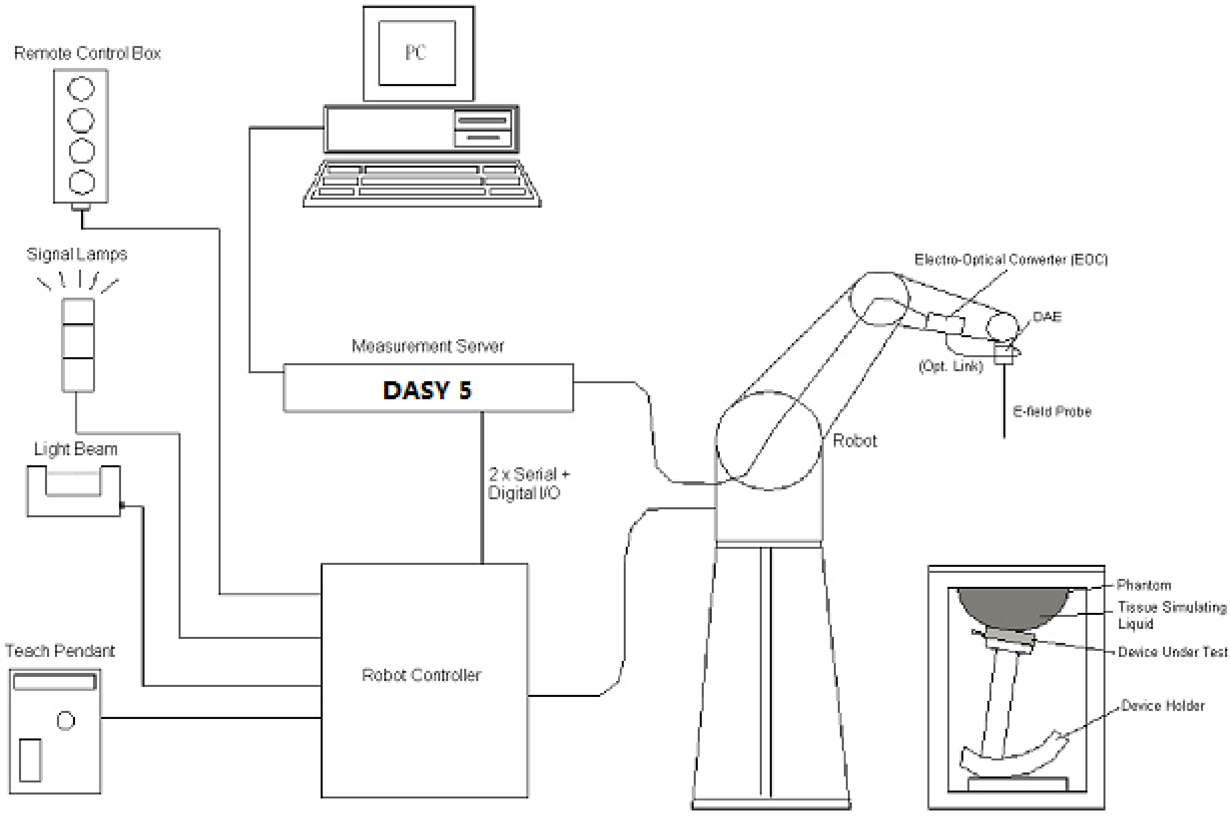


Fig.8.1 SPEAG DASY System Configurations

The DASY system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic (DAE) attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter (EOC) performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows XP
- DASY software
- Remove control with teach pendant and additional circuitry for robot safety such as warming lamps, etc.
- The SAM twin phantom
- A device holder
- Tissue simulating liquid
- Dipole for evaluating the proper functioning of the system

Component details are described in the following sub-sections.

8.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG). The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

- **E-Field Probe Specification**
  <EX3DV4 Probe>

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency Directivity	10MHz to 6 GHz; Linearity: ± 0.2 dB ± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to 100 mW/g; Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 330 mm (Tip: 20mm) Tip diameter: 2.5 mm (Body: 12mm) Typical distance from probe tip to dipole centers: 1 mm

Fig.8.2 Photo of E-Field Probe

- **E-Field Probe Calibration**
  Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than ±10%. The spherical isotropy shall be evaluated and within ±0.25 dB. The sensitivity parameters (Norm X, Norm Y and Norm Z), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to appendix E of this report.

8.2 Data Acquisition Electronics (DAE)

The Data acquisition electronics (DAE) 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 measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Fig. 8.3 Photo of DAE

8.3 Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX60XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY5: CS8c) from Stäubliis used. The Stäublirobot series have many features that are important for our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; nobelt drives)
- Jerk-free straight movements
- Low ELF interference (motor control fields shielded via the closed metallic constructionshields)

Fig. 8.4 Photo of Robot

8.4 Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY 5: 400MHz, Intel Celeron), chip-disk (DASY5: 128 MB), RAM (DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.
The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.

Fig. 8.5 Photo of Server for DASY5

8.5 Light Beam Unit

The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.
The repeatability of this process is better than0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.

Fig. 8.6 Photo of Light Beam

8.6 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ±0.2 mm; Center ear point: 6 ±0.2 mm
Filling Volume Dimensions	Approx. 25 liters Length: 1000mm; Width: 500mm; Height: adjustable feet
Measurement Areas	Left Head, Right Head, Flat phantom

Fig. 8.7Photo of SAM Phantom

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI4 Phantom>

The ELI4 phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209-2 and all known tissue simulating liquids.

ELI4 has been optimized regarding its performance and can be integrated into a SPEAG standard phantom table. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points

The phantom can be used with the following tissue simulating liquids:

- Water-sugar based liquids can be left permanently in the phantom. Always cover the liquid if the system is not in use; otherwise the parameters will change due to water evaporation.
- DGBE based liquids should be used with care. As DGBE is a softener for most plastics, the liquid should be taken out of the phantom and the phantom should be dried when the system is not in use (desirable at least once a week).
- Do not use other organic solvents without previously testing the phantom resistiveness.

Fig.8.8 Photo of ELI4 Phantom

8.7 Device Holder

<Device Holder for SAM Twin Phantom>

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of ±0.5 mm would produce a SAR uncertainty of ± 20 %. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (ERP).

Thus the device needs no repositioning when changing the angles.

The DASY device holder is constructed of low-low POM material having the following dielectric parameters: relative permittivity ε = 3 and loss tangent δ = 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

Fig. 8.9Photo of Device Holder

8.8 Data storage and Evaluation

➤ **Data Storage**

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The post-processing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verifications of the complete software setup even after the measurement and allows correction of erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type (e.g., [V/m], [mW/g]). Some of these units are not available in certain situations or give meaningless results, e.g., a SAR-output in a non-lose media, will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

➤ **Data Evaluation**

The DASY post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe Parameters:	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion	$ConvF_i$
	- Diode compression point	dcp_i
Device Parameters:	- Frequency	f
	- Crest	cf
Media Parameters:	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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 as:

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

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

H-Field Probes: $H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$

With V_i = compensated signal of channel i, (i = x, y, z)
$Norm_i$= senor sensitivity of channel i, (i = x, y, z), µV/ (V/m) ^{2}
ConvF = sensitivity enhancement in solution
a_{ij}= sensor sensitivity factors for H-field probes
f = carrier frequency (GHz)
E_i = electric field strength of channel i in V/m
Hi = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian 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 mW/g
E_{tot}= total field strength in V/m
σ = conductivity in (mho/m) or (Siemens/m)
ρ= equipment tissue density in g/cm^3

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

8.9 Test Equipment List

Manufacturer	Equipment Description	Model	S/N	Cal. Information	
				Last Cal.	Due Date
SPEAG	835MHz System Validation Kit	D835V2	4d154	06.11.2019	06.10.2022
SPEAG	1900MHz System Validation Kit	D1900V2	5d175	06.11.2019	06.10.2022
SPEAG	2450MHz System Validation Kit	D2450V2	910	06.10.2019	06.09.2022
SPEAG	2600MHz System Validation Kit	D2600V2	1114	11.05.2018	11.04.2021
SPEAG	Data Acquisition Electronics	DAE4	1373	08.09.2019	08.08.2020
SPEAG	Dosimetric E-Field Probe	EX3DV4	3924	08.30.2019	08.29.2020
SPEAG	DASY 52 Measurement Software	DASY 52	Version: 52.8.8.1222	N.C.R	N.C.R
SPEAG	DASY 52 File Conversion Software	SEMCAD X	Version: 14.6.10 (7331)	N.C.R	N.C.R
SPEAG	Phantom	Twin Phantom	1765	N.C.R	N.C.R
SPEAG	Phantom	ELI V5.0	1208	N.C.R	N.C.R
SPEAG	Phone Positioner	N/A	N/A	N.C.R	N.C.R
Stäubli	Robot	TX60L	F13/5P6VB1/A/01	N.C.R	N.C.R
Anritsu	Universal Radio Communication Analyzer	MT8820C	6201060814	03.18.2019	03.17.2020
R&S	Universal Radio Communication Tester	CMU200	113097	03.18.2019	03.17.2020
Rohde & Schwarz	Simulated Station	CMW500	140493	07.22.2019	07.21.2020
HP	Network Analyzer	8753D	3410A06291	07.22.2019	07.21.2020
Agilent	Spectrum Analyzer	N9020A	MY50510123	11.10.2018	11.09.2019
Agilent	Spectrum Analyzer	ESRP7	101070	03.18.2019	03.17.2020
R&S	Spectrum Analyzer	FSP30	101454	03.18.2019	03.17.2020
R&S	Signal Generator	N5182A	MY49060014	11.07.2018	11.06.2019
Huber Suhner	RF Cable	SUCOFLEX	12341	See Note 3	
Huber Suhner	RF Cable	SUCOFLEX	17268	See Note 3	
Huber Suhner	RF Cable	SUCOFLEX	2080	See Note 3	
Weinschel	Attenuator	23-3-34	BL5513	See Note 3	
Weinschel	Attenuator	23-3-34	BL5513	See Note 3	
N/A	Directional Coupler	SHWDCP-050180-10S	281	See Note 3	
SPEAG	Dielectric Assessment Kit	3.5 Probe	1119	See Note 4	
SPEAG	DAK Measurement Software	DAK	Version: DAK 3.5	N.C.R	
ERA	Wideband Amplifier	WDA-00100800-24P26	LNA-00500200-2515	See Note 5	

Note:
1. The calibration certificate of DASY can be referred to appendix C of this report.
2. Referring to KDB 865664 D01v01r04, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
4. The dielectric probe kit was calibrated via the network analyzer, with the specified procedure (calibrated in pure water) and calibration kit (standard) short circuit, before the dielectric measurement. The specific procedure and calibration kit are provided by Speag.
5. In system check we need to monitor the level on the spectrum analyzer, and adjust the power amplifier level to have precise power level to the dipole; the measured SAR will be normalized to 1 W input power according to the ratio of 1 W to the input power to the dipole. For system check, the calibration of the power amplifier is deemed not critically required for correct measurement; the spectrum analyzer is critical and we do have calibration for it
6. Attenuator insertion loss is calibrated by the network Analyzer, which the calibration is valid, before system check.
7. N.C.R means No Calibration Requirement.

9 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 9.1, for body SAR testing, the liquid height from the center of the flat phantom to liquid top surface is larger than 15 cm, which is shown in Fig. 9.2.

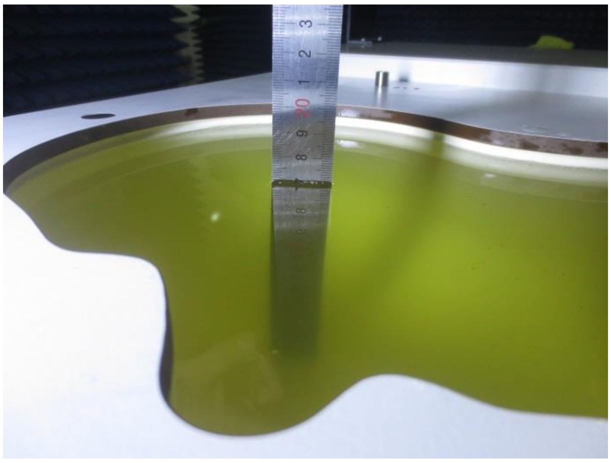


Fig. 9.1 Photo of Liquid Height for Head SAR (700MHz~1000MHz)(depth>15cm)

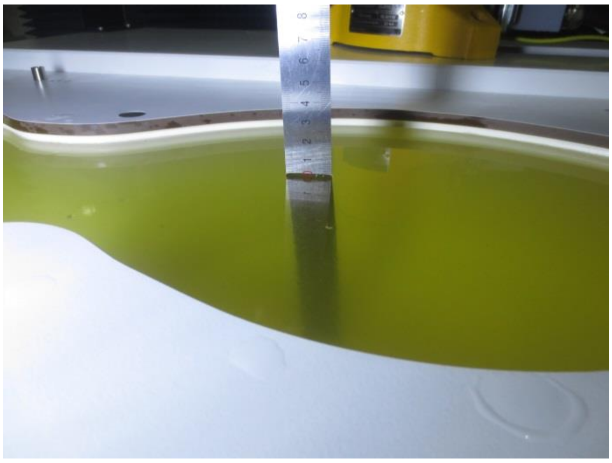


Fig. 9.2 Photo of Liquid Height for Body SAR (700MHz~1000MHz)(depth>15cm)

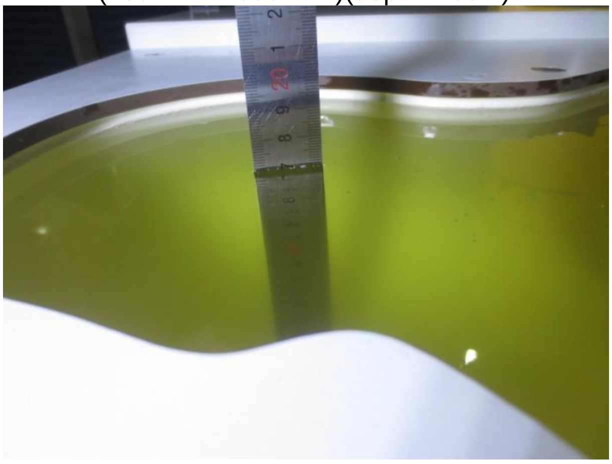


Fig. 9.3 Photo of Liquid Height for Head SAR (1700MHz~2000MHz)(depth>15cm)

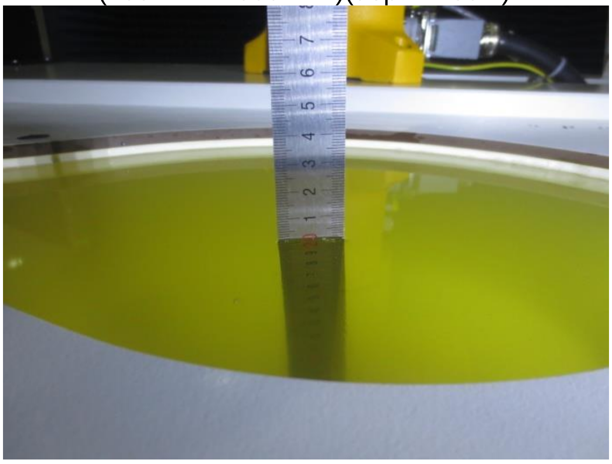


Fig. 9.4 Photo of Liquid Height for Body SAR (1700MHz~2000MHz) (depth>15cm)

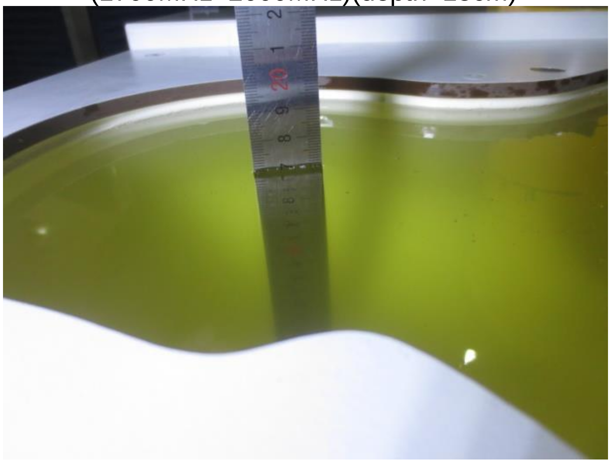


Fig. 9.5 Photo of Liquid Height for Head SAR (2000MHz~2600MHz)(depth>15cm)

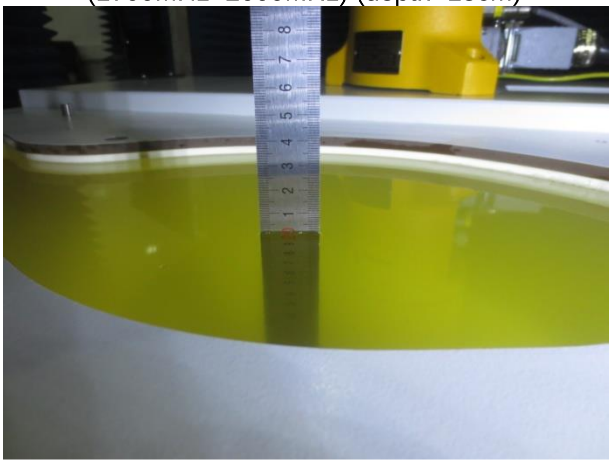


Fig. 9.6 Photo of Liquid Height for Body SAR (2000MHz~2600MHz)(depth>15cm)

The following table gives the recipes for tissue simulating liquid.

Frequency (MHz)	**Real part of the complex relative permittivity, ε′r**	**Conductivity, σ (S/m)**
30	55.0	0.75
150	52.3	0.76
300	45.3	0.87
450	43.5	0.87
835	41.5	0.90
900	41.5	0.97
1450	40.5	1.20
1800	40.0	1.40
1900	40.0	1.40
1950	40.0	1.40
2000	40.0	1.40
2100	39.8	1.49
2450	39.2	1.80
2600	39.0	1.96
3000	38.5	2.40
4000	37.4	3.43
5000	36.2	4.45
5200	36.0	4.65
5400	35.8	4.86
5600	35.5	5.06
5800	35.4	5.27
6000	35.1	5.48

Note:

According to EN 62209-2:2010, the liquid parameters for head are the same as body requirements.

The dielectric parameters of liquids were verified prior to the SAR evaluation using a Speag Dielectric Probe Kit and an Agilent Network Analyzer.
The following table shows the measuring results for simulating liquid.

Frequency (MHz)	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (εr)	Conductivity Target(σ)	Permittivity Target(εr)	Delta (σ)%	Delta (εr)%	Limit (%)	Date (dd/mm/yy)
835	22.9	0.91	41.26	0.90	41.5	1.11	-0.58	±5	12.10.2019
1900	22.8	1.42	39.62	1.40	40.0	1.43	-0.95	±5	09.10.2019
2450	22.6	1.83	39.70	1.80	39.2	1.67	1.28	±5	21.10.2019
2600	22.6	2.01	38.47	1.96	39.0	2.55	-1.36	±5	21.10.2019

10 SAR System Verification

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

- **Purpose of System Performance check**
  The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

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

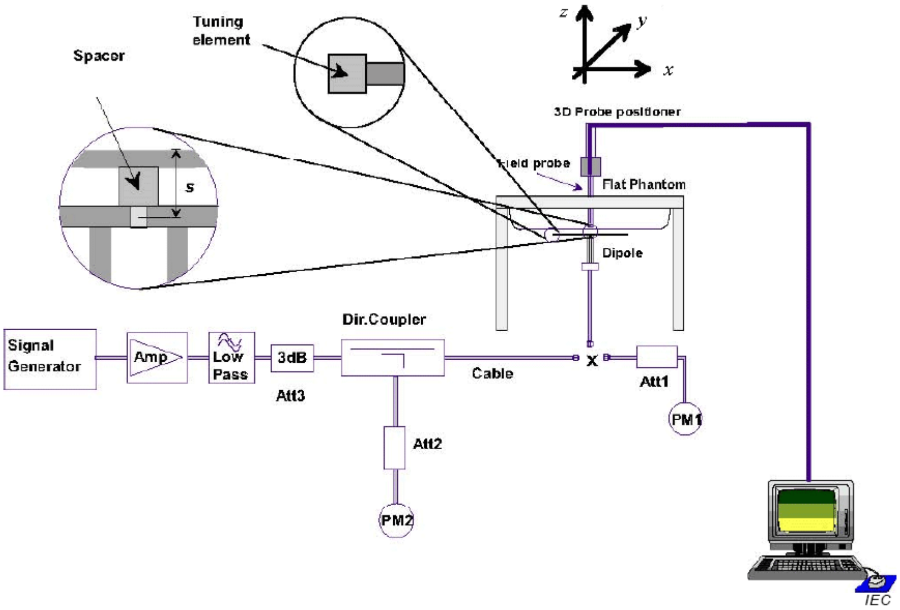


Fig.10.1 System Verification Setup Diagram

Fig.10.2 Photo of Dipole setup

- **System Verification Results**

  Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10%. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table as below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix C of this report.

Date (dd/mm/yy)	Frequency (MHz)	Power fed onto dipole (mW)	Measured 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Target 10g SAR (W/kg)	Deviation (%)
12.10.2019	835	80	0.521	6.51	6.33	2.84
09.10.2019	1900	40	0.835	20.88	20.4	2.35
21.10.2019	2450	40	0.982	24.55	24.4	0.61
21.10.2019	2600	40	0.984	24.58	25.1	-2.07

11 EUT Testing Position

This EUT was tested in six different positions. They are right cheek/right tilted/left cheek/left tilted for head, Front/Back of the EUT with phantom 5 mm gap, as illustrated below, please refer to Appendix B for the test setup photos.

11.1 Handset Reference Points

- The vertical centreline passes through two points on the front side of the handset – the midpoint of the width w_t of the handset at the level of the acoustic output, and the midpoint of the width w_b of the bottom of the handset.
- The horizontal line is perpendicular to the vertical centreline and passes the center of the acoustic output. The horizontal line is also tangential to the handset at point A.
- The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centreline is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

Fig.11.1 Illustration for Front, Back and Side of SAM Phantom

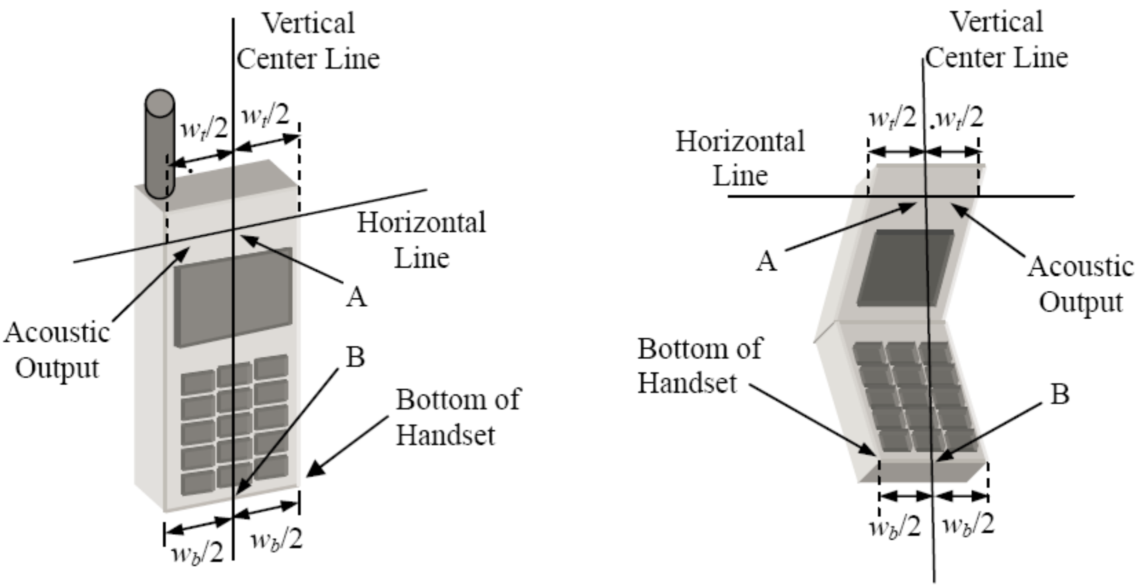


Fig. 11.2Illustration for Handset Vertical and Horizontal Reference Lines

11.2 Positioning for Cheek / Touch

- To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear and LE: Left Ear) and align the center of the ear piece with the line RE-LE.
- To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost (see below figure)

Fig. 11.3 Illustration for Cheek Position

11.3 Positioning for Ear / 15º Tilt

- To position the device in the “cheek” position described above.
- While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost (see figure below).

Fig.11.4 Illustration for Tilted Position

11.4 Body Worn Accessory Configurations

- To position the device parallel to the phantom surface with either keypad up or down.
- To adjust the device parallel to the flat phantom.
- To adjust the distance between the device surface and the flat phantom to 5 mm or holster surface and the flat phantom to 0 mm.

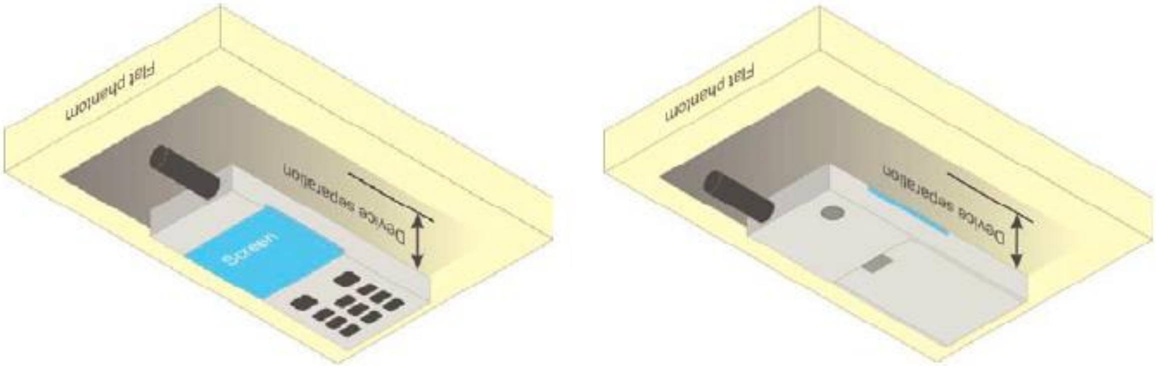


Fig.11.5 Illustration for Body Worn Position

12 Measurement Procedures

The measurement procedures are as bellows:

<Conducted power measurement>

- For WWAN power measurement, use base station simulator to configure EUT WWAN transition in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
- Read the WWAN RF power level from the base station simulator.
- For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band.
- Connect EUT RF port through RF cable to the power meter or spectrum analyzer, and measure WLAN/BT output power.

<Conducted power measurement>

- Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
- Place the EUT in positions as Appendix B demonstrates.
- Set scan area, grid size and other setting on the DASY software.
- Measure SAR results for the highest power channel on each testing position.
- Find out the largest SAR result on these testing positions of each band.
- Measure SAR results for other channels in worst SAR testing position if the Reported SAR or highest power channel is larger than 0.8 W/kg.

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- Power reference measurement
- Area scan
- Zoom scan
- Power drift measurement

12.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a “cube” measurement. The measured volume must include the 1g and 10 g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

- Extraction of the measured data (grid and values) from the Zoom Scan.
- Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters).
- Generation of a high-resolution mesh within the measured volume.
- Interpolation of all measured values form the measurement grid to the high-resolution grid
- Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- Calculation of the averaged SAR within masses of 1g and 10g.

12.2 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurement are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

12.3 Area Scan Procedures

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a10mm^2 step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments.
When an Area Scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE1528-2003, EN 50361 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan).

12.4 Zoom Scan Procedures

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. A density of 1000 kg/m^3 is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1g cube is 10mm, with the side length of the 10 g cube 21,5mm.The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications utilize a physical step of 5x5x7 (8mmx8mmx5mm)providing a volume of 32mm in the X & Y axis, and 30mm in the Z axis.

12.5 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Sheppard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1g and 10g cubes, the extrapolation distance should not be larger than 5 mm.

12.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

13 RF Output Power

13.1 GSM Conducted Power

SIM 1:

Band	GSM 900			DCS 1800		
Channel	975	60	124	512	700	885
Frequency	880.2	902	914.8	1710.2	1747.8	1748.8
GSM	32.43	32.15	32.62	29.18	29.25	29.18
GPRS (1 TX Slot)	32.42	32.16	32.60	29.16	29.24	29.18
GPRS (2 TX Slots)	31.58	31.32	31.78	28.26	28.30	28.23
GPRS (3 TX Slots)	30.60	30.43	30.82	26.68	26.82	26.71
GPRS (4 TX Slots)	29.72	29.36	29.89	25.77	25.86	25.78
EGPRS (1 TX Slot)	26.75	26.62	26.59	25.84	25.97	25.66
EGPRS (2 TX Slots)	24.78	24.68	24.64	24.05	24.12	24.01
EGPRS (3 TX Slots)	22.83	22.74	22.70	22.10	22.28	22.03
EGPRS (4 TX Slots)	20.94	20.77	20.69	20.51	20.32	20.42

Note:

1. Cuz the conducted Power of SIM 2 less than SIM 1, we chose SIM 1 to perform a SAR test.

13.2 WCDMA Conducted Power

Band	WCDMA Band I			WCDMA Band VIII		
Channel	9612	9750	9888	2712	2788	2863
Frequency	1922.4	1950	1977.6	882.4	897.6	912.6
WCDMA	22.13	22.10	22.07	22.12	22.15	22.11
HSDPA Sub-test 1	21.17	21.24	21.14	21.04	21.18	21.02
HSDPA Sub-test 2	20.38	20.44	20.64	20.53	20.73	20.44
HSDPA Sub-test 3	19.94	19.89	19.57	19.68	19.34	19.46
HSDPA Sub-test 4	19.64	19.72	19.62	19.53	19.79	19.47
HSUPA Sub-test 1	18.92	20.91	20.66	18.86	20.88	20.54
HSUPA Sub-test 2	21.25	21.20	21.16	21.07	21.15	20.90
HSUPA Sub-test 3	20.04	20.08	19.73	19.92	19.97	19.75
HSUPA Sub-test 4	21.27	21.30	21.17	21.11	21.20	21.02
HSUPA Sub-test 5	20.44	20.61	20.55	20.31	20.57	20.42

13.3 LTE Conducted Power

Band	Modulation	Bandwidth (MHz)	UL Channel	Frequency	RB Size	RB Position	Power (dBm)
1	QPSK	5	18025	1922.5	1	#0	23.05
					1	#Max	23.13
					8	#0	23.22
					8	#Max	23.29
			18300	1950.0	1	#0	23.42
					1	#Max	23.38
					8	#0	23.49
					8	#Max	23.50
			18575	1977.5	1	#0	23.36
					1	#Max	23.35
					8	#0	23.46
					8	#Max	23.40
		20	18100	1930.0	1	#0	23.03
					1	#Max	23.12
					18	#0	23.10
					18	#Max	23.25
			18300	1950.0	1	#0	23.20
					1	#Max	23.23
					18	#0	23.26
					18	#Max	23.28
			18500	1970.0	1	#0	23.17
					1	#Max	23.18
					18	#0	23.32
					18	#Max	23.26

Band	Modulation	Bandwidth (MHz)	UL Channel	Frequency	RB Size	RB Position	Power (dBm)
3	QPSK	1.4	19207	1710.7	1	#0	22.56
					1	#Max	22.57
					5	#0	22.54
					5	#Max	22.56
			19575	1747.5	1	#0	23.36
					1	#Max	23.40
					5	#0	23.38
					5	#Max	23.43
			19943	1784.3	1	#0	23.32
					1	#Max	23.32
					5	#0	23.45
					5	#Max	23.50
		5	19225	1712.5	1	#0	22.43
					1	#Max	22.51
					8	#0	22.52
					8	#Max	22.60
			19575	1747.5	1	#0	23.19
					1	#Max	23.21
					8	#0	23.26
					8	#Max	23.32
			19925	1782.5	1	#0	23.21
					1	#Max	23.22
					8	#0	23.32
					8	#Max	23.36
		20	19300	1720.0	1	#0	22.36
					1	#Max	22.69
					18	#0	22.54
					18	#Max	22.81
			19575	1747.5	1	#0	22.93
					1	#Max	23.28
					18	#0	22.97
					18	#Max	23.33
			19850	1775.0	1	#0	23.10
					1	#Max	23.15
					18	#0	23.22
					18	#Max	23.23

Band	Modulation	Bandwidth (MHz)	UL Channel	Frequency	RB Size	RB Position	Power (dBm)
7	QPSK	5	20775	2502.5	1	#0	22.87
					1	#Max	22.85
					8	#0	22.91
					8	#Max	22.93
			21100	2535.0	1	#0	23.21
					1	#Max	23.23
					8	#0	23.31
					8	#Max	23.28
			21425	2567.5	1	#0	23.28
					1	#Max	23.33
					8	#0	23.47
					8	#Max	23.48
		20	20850	2510.0	1	#0	22.73
					1	#Max	22.83
					18	#0	22.79

					18	#Max	22.91
			21100	2535.0	1	#0	22.98
					1	#Max	23.07
					18	#0	23.13
					18	#Max	23.14
			21350	2560.0	1	#0	23.27
					1	#Max	23.28
					18	#0	23.23
					18	#Max	23.23

Band	Modulation	Bandwidth (MHz)	UL Channel	Frequency	RB Size	RB Position	Power (dBm)
8	QPSK	1.4	21457	880.7	1	#0	23.33
					1	#Max	23.36
					5	#0	23.32
					5	#Max	23.33
			21625	897.5	1	#0	23.47
					1	#Max	23.42
					5	#0	23.51
					5	#Max	23.51
			21793	21793	1	#0	23.49
					1	#Max	23.54
					5	#0	23.49
					5	#Max	23.55
		5	21475	882.5	1	#0	23.22
					1	#Max	23.28
					8	#0	23.22
					8	#Max	23.27
			21625	897.5	1	#0	23.37
					1	#Max	23.44
					8	#0	23.40
					8	#Max	23.53
			21775	912.5	1	#0	23.46
					1	#Max	23.39
					8	#0	23.52
					8	#Max	23.50
		10	21500	885.0	1	#0	23.25
					1	#Max	23.49
					12	#0	23.24
					12	#Max	23.43
			21625	897.5	1	#0	23.52
					1	#Max	23.57
					12	#0	23.46
					12	#Max	23.55
			21750	910.0	1	#0	23.43
					1	#Max	23.45
					12	#0	23.51
					12	#Max	23.60

Band	Modulation	Bandwidth (MHz)	UL Channel	Frequency	RB Size	RB Position	Power (dBm)
20	QPSK	5	24175	834.5	1	#0	22.66
					1	#Max	22.72
					8	#0	22.76
					8	#Max	22.81
			24300	847.0	1	#0	22.73
					1	#Max	22.76
					8	#0	22.84
					8	#Max	22.80
			24425	859.5	1	#0	22.71
					1	#Max	22.70
					8	#0	22.78
					8	#Max	22.86
		20	24250	842.0	1	#0	22.44
					1	#Max	22.61
					18	#0	22.59
					18	#Max	22.72
			24300	847.0	1	#0	22.62
					1	#Max	22.70
					18	#0	22.63
					18	#Max	22.82
			24350	852.0	1	#0	22.53
					1	#Max	22.60
					18	#0	22.71
					18	#Max	22.71

13.4 2.4GHz WLAN EIRP Power

Average Power (dBm)				
Channel	Frequency (MHz)	802.11b	802.11g	802.11n-HT20
CH 01	2412	14.94	13.46	11.37
CH 07	2442	14.94	13.68	11.34
CH 13	2472	**15.08**	13.71	11.53

Note:

1. When the EUT in continuously transmitting mode, the actual duty cycle is 96.5%, so the duty cycle factor is 1.04.

13.5 Bluetooth EIRP Power

Bluetooth Average Power (dBm)			
Modulation	GFSK	π/4-DQPSK	8DPSK
Output Power	**3.81**	0.43	0.45

Average Power (dBm)		
Channel	Frequency (MHz)	BLE
CH 00	2402	-0.30
CH 20	2442	0.51
CH 39	2480	0.92

Note:

1. According to EN 62479, Cuz $P_{BT,max}$= 3.81dBm= 2.40 mW< 20mW, stand-alone SAR testfor Bluetooth is exclusion.

14 EUT Antenna Locations

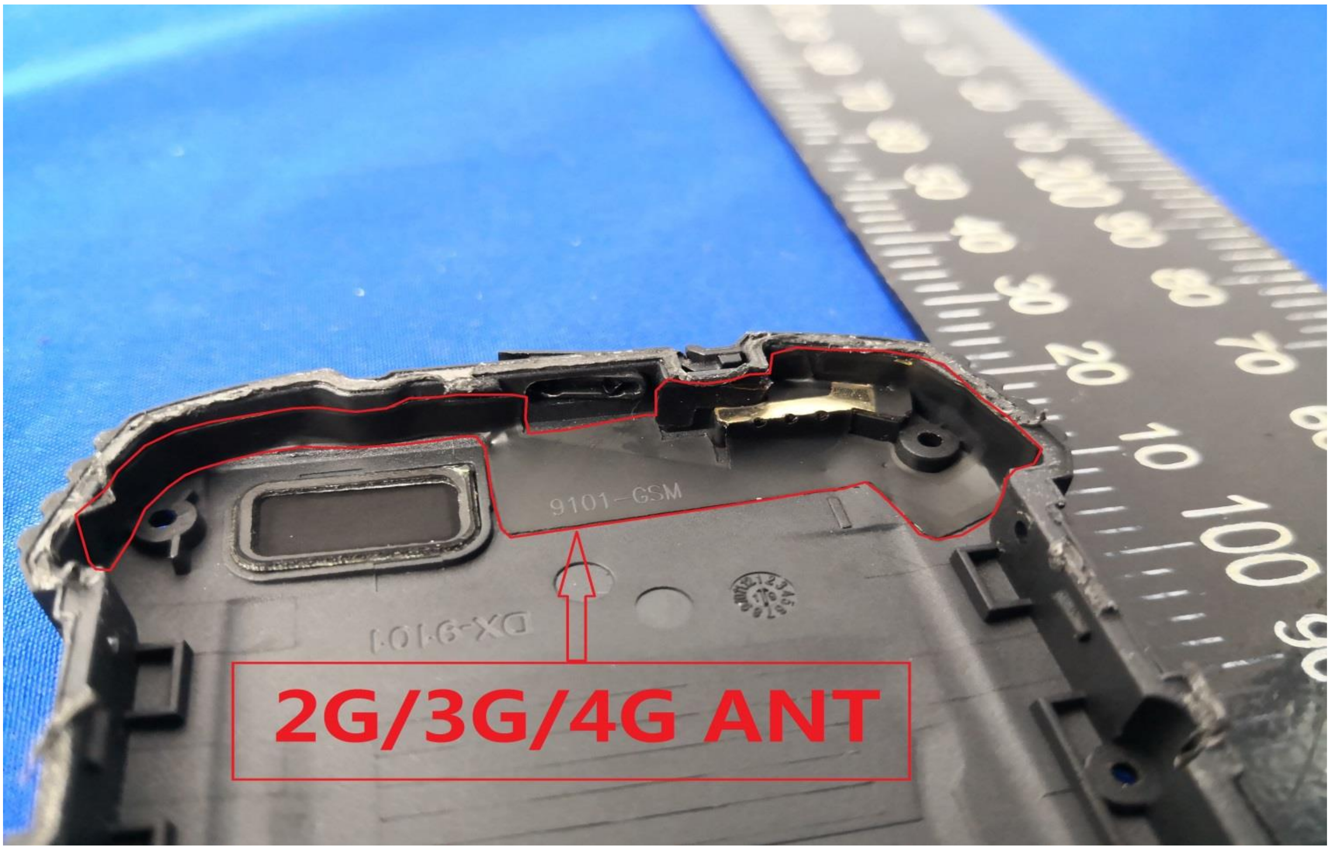


Fig.14.1 EUT Antenna Locations

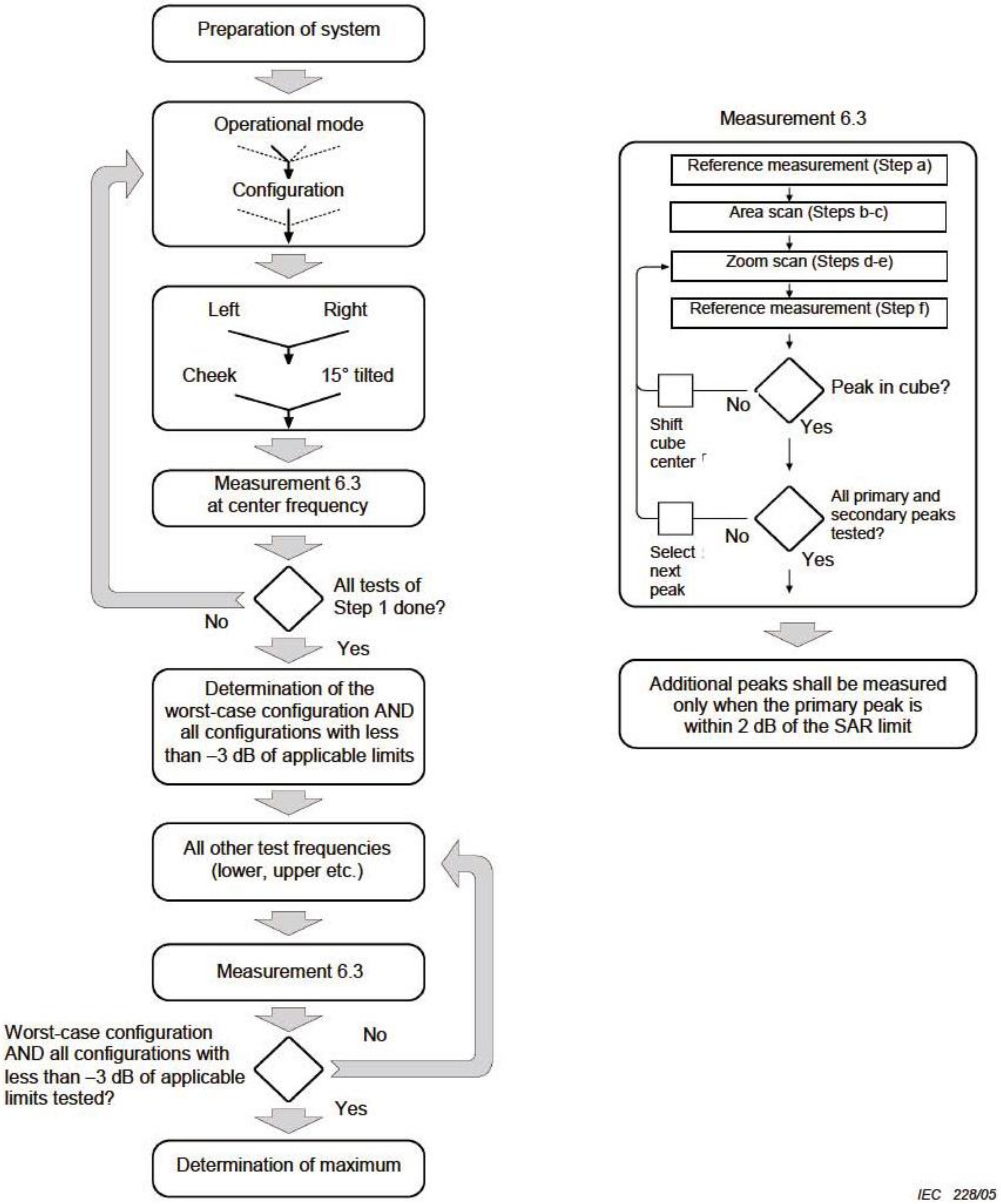
14.1 Test Positions Consideration

Distance of Antennas to EUT edge/surface Test distance: 5mm						
Antennas	**Back**	**Front**	**Top Side**	**Bottom Side**	**Right Side**	**Left Side**
2G/3G/4G	<25mm	<25mm	102mm	<25mm	<25mm	<25mm
WLAN & Bluetooth	<25mm	<25mm	<25mm	103mm	41mm	<25mm

Test Positions Test distance: 5mm						
Antennas	**Back**	**Front**	**Top Side**	**Bottom Side**	**Right Side**	**Left Side**
2G/3G/4G	Yes	Yes	No	Yes	Yes	Yes
WLAN & Bluetooth	Yes	Yes	Yes	No	No	Yes

15 Block diagram of the tests to be Performed

15.1 Head



15.2 Body

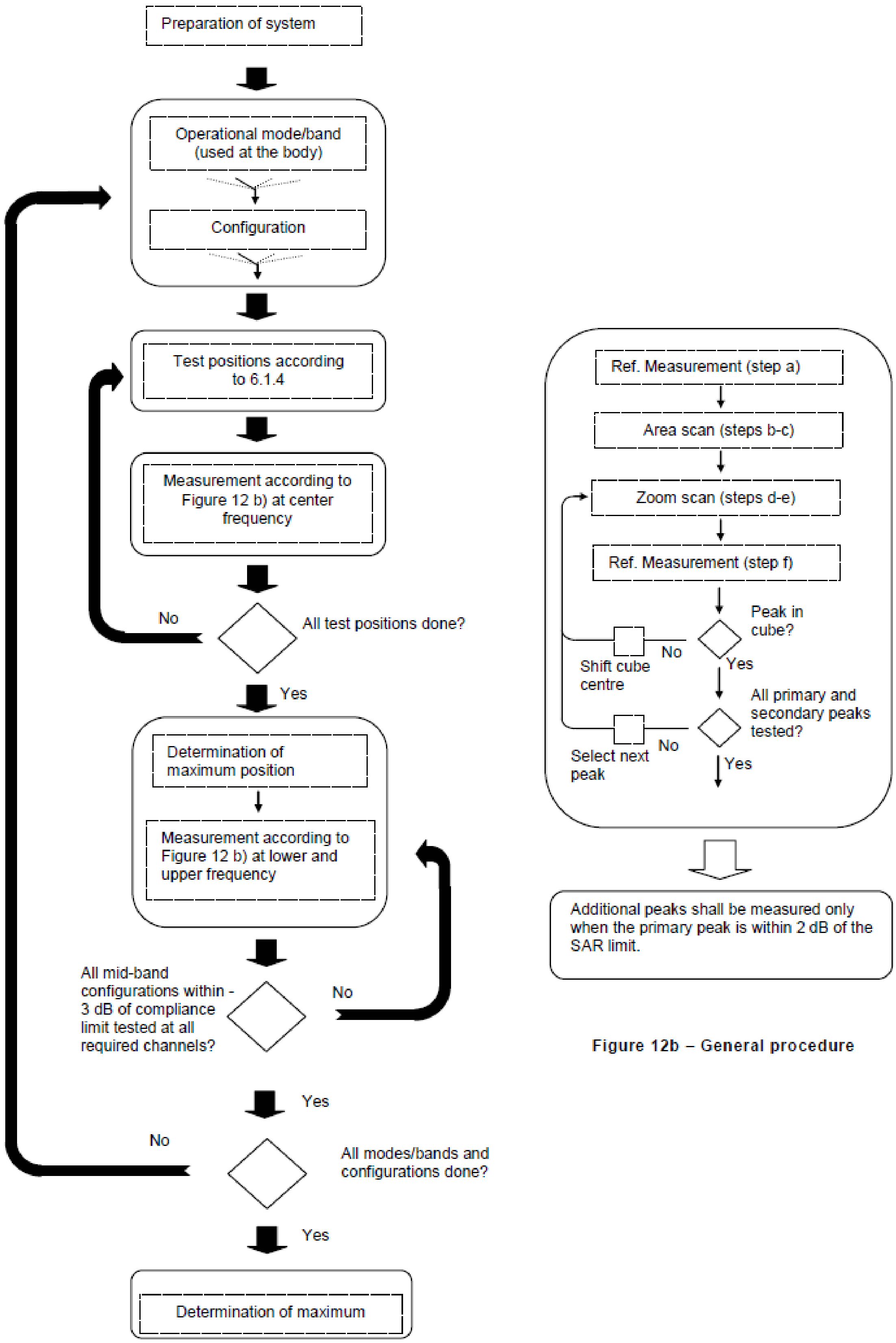


Figure 12b – General procedure

16 SAR Test Results Summary

16.1 Head SAR Data

➢ GSM Head SAR

Plot No.	Band/Mode	Test Position	CH.	Freq. (MHz)	Ave. Power (dBm)	Power Drift (dB)	Tune-Up Limit (dBm)	Meas. SAR_{10g} (W/kg)	Scaling Factor	Reported SAR_{10g} (W/kg)
1	GSM900/Voice	Right Cheek	60	902	32.15	0.15	32.5	**0.387**	1.084	0.420
	GSM900/Voice	Right Tilted	60	902	32.15	0.31	32.5	0.144	1.084	0.156
	GSM900/Voice	Left Cheek	60	902	32.15	-0.06	32.5	0.363	1.084	0.393
	GSM900/Voice	Left Tilted	60	902	32.15	0.07	32.5	0.131	1.084	0.142
	GSM900/Voice	Right Cheek	975	880.2	32.43	0.10	32.5	0.327	1.016	0.332
	GSM900/Voice	Right Cheek	124	914.8	32.62	-0.19	33.0	0.289	1.091	0.315
	GSM1800/Voice	Right Cheek	700	1747.8	29.25	-0.23	29.5	0.209	1.059	0.221
	GSM1800/Voice	Right Tilted	700	1747.8	29.25	-0.17	29.5	0.090	1.059	0.095
2	GSM1800/Voice	Left Cheek	700	1747.8	29.25	-0.34	29.5	**0.232**	1.059	0.246
	GSM1800/Voice	Left Tilted	700	1747.8	29.25	0.11	29.5	0.099	1.059	0.105
	GSM1800/Voice	Left Cheek	512	1710.2	29.18	-0.20	29.5	0.197	1.076	0.212
	GSM1800/Voice	Left Cheek	885	1784.8	29.18	0.18	29.5	0.186	1.076	0.200
SAR LIMIT Uncontrolled Exposure/General Population					**2.0 W/kg (mW/g) Averaged over 10g**					

➢ WCDMA Head SAR

Plot No.	Band/Mode	Test Position	CH.	Freq. (MHz)	Ave. Power (dBm)	Power Drift (dB)	Tune-Up Limit (dBm)	Meas. SAR_{10g} (W/kg)	Scaling Factor	Reported SAR_{10g} (W/kg)
	WCDMA Band I	Right Cheek	9750	1950	22.10	-0.12	22.5	0.079	1.096	0.087
	WCDMA Band I	Right Tilted	9750	1950	22.10	0.08	22.5	0.031	1.096	0.034
3	WCDMA Band I	Left Cheek	9750	1950	22.10	0.21	22.5	**0.117**	1.096	0.128
	WCDMA Band I	Left Tilted	9750	1950	22.10	-0.16	22.5	0.061	1.096	0.067
	WCDMA Band I	Left Cheek	9612	1922.4	22.13	-0.27	22.5	0.099	1.089	0.108
	WCDMA Band I	Left Cheek	9888	1977.6	22.07	0.14	22.5	0.087	1.104	0.096
4	WCDMA Band VIII	Right Cheek	2788	897.6	22.15	-0.29	22.5	**0.366**	1.084	0.397
	WCDMA Band VIII	Right Tilted	2788	897.6	22.15	-0.10	22.5	0.138	1.084	0.150
	WCDMA Band VIII	Left Cheek	2788	897.6	22.15	-0.16	22.5	0.332	1.084	0.360
	WCDMA Band VIII	Left Tilted	2788	897.6	22.15	0.09	22.5	0.126	1.084	0.137
	WCDMA Band VIII	Right Cheek	2712	882.4	22.12	-0.15	22.5	0.354	1.091	0.386
	WCDMA Band VIII	Right Cheek	2863	912.6	22.11	0.12	22.5	0.325	1.094	0.356
SAR LIMIT Uncontrolled Exposure/General Population					**2.0 W/kg (mW/g) Averaged over 10g**					

➢ LTE Head SAR

Plot No.	Band/Mode	Test Position	CH.	Freq. (MHz)	Ave. Power (dBm)	Power Drift (dB)	Tune-Up Limit (dBm)	Meas. SAR_{10g} (W/kg)	Scaling Factor	Reported SAR_{10g} (W/kg)
	LTE Band 1 /1RB#0 20M	Right Cheek	18300	1950.0	23.28	0.14	23.5	0.068	1.052	0.072
	LTE Band 1 /1RB#0 20M	Right Tilted	18300	1950.0	23.28	-0.21	23.5	0.028	1.052	0.029
5	LTE Band 1 /1RB#0 20M	Left Cheek	18300	1950.0	23.28	-0.01	23.5	**0.078**	1.052	0.082
	LTE Band 1 /1RB#0 20M	Left Tilted	18300	1950.0	23.28	0.18	23.5	0.032	1.052	0.034
	LTE Band 1 /1RB#0 20M	Left Cheek	18100	1930.0	23.25	0.14	23.5	0.065	1.059	0.069
	LTE Band 1 /1RB#0 20M	Left Cheek	18500	1970.0	23.32	-0.10	23.5	0.071	1.042	0.074

	LTE Band 3 /1RB#0 20M	Right Cheek	19575	1747.5	23.33	-0.27	23.5	0.182	1.04	0.189
	LTE Band 3 /1RB#0 20M	Right Tilted	19575	1747.5	23.33	0.15	23.5	0.086	1.04	0.089
6	LTE Band 3 /1RB#0 20M	Left Cheek	19575	1747.5	23.33	-0.09	23.5	**0.291**	1.04	0.303
	LTE Band 3 /1RB#0 20M	Left Tilted	19575	1747.5	23.33	-0.21	23.5	0.132	1.04	0.137
	LTE Band 3 /1RB#0 20M	Left Cheek	19300	1720.0	22.81	-0.18	23.0	0.267	1.045	0.279
	LTE Band 3 /1RB#0 20M	Left Cheek	19850	1775.0	23.23	-0.11	23.5	0.283	1.064	0.301
7	LTE Band 7 /1RB#0 20M	Right Cheek	21100	2535.0	23.14	0.24	23.5	**0.090**	1.086	0.098
	LTE Band 7 /1RB#0 20M	Right Tilted	21100	2535.0	23.14	-0.06	23.5	0.041	1.086	0.045
	LTE Band 7 /1RB#0 20M	Left Cheek	21100	2535.0	23.14	-0.12	23.5	0.085	1.086	0.092
	LTE Band 7 /1RB#0 20M	Left Tilted	21100	2535.0	23.14	-0.25	23.5	0.035	1.086	0.038
	LTE Band 7 /1RB#0 20M	Right Cheek	20850	2510.0	22.91	-0.19	23.0	0.068	1.021	0.069
	LTE Band 7 /1RB#0 20M	Right Cheek	21350	2560.0	23.28	-0.17	23.5	0.084	1.052	0.088
8	LTE Band 8 /1RB#0 10M	Right Cheek	21625	897.5	23.57	-0.29	24.0	**0.403**	1.104	0.445
	LTE Band 8 /1RB#0 10M	Right Tilted	21625	897.5	23.57	-0.22	24.0	0.172	1.104	0.190
	LTE Band 8 /1RB#0 10M	Left Cheek	21625	897.5	23.57	-0.18	24.0	0.364	1.104	0.402
	LTE Band 8 /1RB#0 10M	Left Tilted	21625	897.5	23.57	0.16	24.0	0.165	1.104	0.182
	LTE Band 8 /1RB#0 10M	Right Cheek	21500	885.0	23.49	0.13	23.5	0.348	1.002	0.349
	LTE Band 8 /1RB#0 10M	Right Cheek	21750	910.0	23.60	-0.12	24.0	0.372	1.096	0.408
9	LTE Band 20 /1RB#0 20M	Right Cheek	24300	847.0	22.82	-0.29	23.0	**0.239**	1.042	0.249
	LTE Band 20 /1RB#0 20M	Right Tilted	24300	847.0	22.82	-0.21	23.0	0.102	1.042	0.106
	LTE Band 20 /1RB#0 20M	Left Cheek	24300	847.0	22.82	0.07	23.0	0.223	1.042	0.232
	LTE Band 20 /1RB#0 20M	Left Tilted	24300	847.0	22.82	-0.09	23.0	0.094	1.042	0.098
	LTE Band 20 /1RB#0 20M	Right Cheek	24250	842.0	22.72	-0.01	23.0	0.217	1.067	0.232
	LTE Band 20 /1RB#0 20M	Right Cheek	24350	852.0	22.71	-0.20	23.0	0.205	1.069	0.219
SAR LIMIT Uncontrolled Exposure/General Population					**2.0 W/kg (mW/g) Averaged over 10g**					

➢ WLAN 2.4 GHz Head SAR

Plot No.	Band/Mode	Test Position	CH.	Freq. (MHz)	Ave. Power (dBm)	Power Drift (dB)	Tune-Up Limit (dBm)	Meas. SAR_{1g} (W/kg)	Scaling Factor	D.C Factor	Reported SAR_{1g} (W/kg)
	802.11b	Right Cheek	07	2442	14.94	0.22	15.0	0.074	1.014	1.04	0.078
	802.11b	Right Tilted	07	2442	14.94	0.15	15.0	0.065	1.014	1.04	0.069
10	802.11b	Left Cheek	07	2442	14.94	0.12	15.0	**0.095**	1.014	1.04	0.100
	802.11b	Left Tilted	07	2442	14.94	0.28	15.0	0.083	1.014	1.04	0.088
	802.11b	Left Cheek	01	2412	14.94	-0.10	15.0	0.068	1.014	1.04	0.072
	802.11b	Left Cheek	13	2472	15.08	0.14	15.5	0.076	1.102	1.04	0.087
SAR LIMIT Uncontrolled Exposure/General Population					**2.0 W/kg (mW/g) Averaged over 10g**						

Note:

1. Determination of the worst-case configuration and all configurations with less than 3 dB of applicable limits.
2. When 10g SAR ≤ 1.0 W/kg, testing for low and high channel is optional.
3. According to EN62209-1 section 6.3, the drift should be kept within ±5%, the units of Power Drift Value measured are V/m, converting to dB should be kept in ±0.42 dB.

16.2 Body Worn SAR Data

➢ GSM Body SAR

Plot No.	Band/Mode	Test Position	CH.	Freq. (MHz)	Ave. Power (dBm)	Power Drift (dB)	Tune-Up Limit (dBm)	Meas. SAR_{10g} (W/kg)	Scaling Factor	Reported SAR_{10g} (W/kg)
	GSM900/Voice	Front	60	902	32.15	-0.09	32.5	0.537	1.084	0.582
	GSM900/Voice	Back	60	902	32.15	-0.07	32.5	0.732	1.084	0.793
	GPRS900/2 slots	Back	60	902	31.32	-0.03	31.5	1.050	1.042	1.094
	GPRS900/2 slots	Back	975	880.2	31.58	-0.10	32.0	1.090	1.102	1.201
	GPRS900/2 slots	Back	124	914.8	31.78	0.12	32.0	0.985	1.052	1.036
	GPRS900/3 slots	Back	60	902	30.43	0.07	30.5	1.240	1.016	1.260
	GPRS900/3 slots	Back	975	880.2	30.60	-0.15	31.0	1.320	1.096	1.447
	GPRS900/3 slots	Back	124	914.8	30.82	-0.02	31.0	1.170	1.042	1.219
	GPRS900/4 slots	Back	60	902	29.36	-0.08	29.5	1.480	1.033	1.529
11	GPRS900/4 slots	Back	975	880.2	29.72	0.03	30.0	**1.570**	1.067	1.675
	GPRS900/4 slots	Back	124	914.8	29.89	0.16	30.0	1.460	1.026	1.498
	GPRS900/4 slots	Left	60	902	29.36	-0.06	29.5	0.064	1.033	0.066
	GPRS900/4 slots	Right	60	902	29.36	0.11	29.5	0.073	1.033	0.075
	GPRS900/4 slots	Bottom	60	902	29.36	-0.15	29.5	0.169	1.033	0.175
	GSM1800/Voice	Front	700	1747.8	29.25	-0.12	29.5	0.423	1.059	0.448
	GSM1800/Voice	Back	700	1747.8	29.25	-0.10	29.5	0.586	1.059	0.621
	GPRS1800/2 slots	Back	700	1747.8	28.30	-0.17	28.5	1.040	1.047	1.089
	GPRS1800/2 slots	Back	512	1710.2	28.26	-0.13	28.5	0.928	1.057	0.981
	GPRS1800/2 slots	Back	885	1784.8	28.23	0.21	28.5	1.010	1.064	1.075
	GPRS1800/3 slots	Back	700	1747.8	26.82	-0.11	27.0	1.140	1.042	1.188
	GPRS1800/3 slots	Back	512	1710.2	26.68	-0.15	27.0	1.050	1.076	1.130
	GPRS1800/3 slots	Back	885	1784.8	26.71	-0.08	27.0	1.110	1.069	1.187
12	GPRS1800/4 slots	Back	700	1747.8	25.86	-0.01	26.0	**1.200**	1.033	1.240
	GPRS1800/4 slots	Back	512	1710.2	25.77	-0.12	26.0	1.080	1.054	1.138
	GPRS1800/4 slots	Back	885	1784.8	25.78	-0.10	26.0	1.160	1.052	1.220
	GPRS1800/4 slots	Left	700	1747.8	25.86	0.03	26.0	0.391	1.033	0.404
	GPRS1800/4 slots	Right	700	1747.8	25.86	0.28	26.0	0.358	1.033	0.370
	GPRS1800/4 slots	Bottom	700	1747.8	25.86	-0.19	26.0	0.754	1.033	0.779
SAR LIMIT Uncontrolled Exposure/General Population					**2.0 W/kg (mW/g) Averaged over 10g**					

➢ WCDMA Body SAR

Plot No.	Band/Mode	Test Position	CH.	Freq. (MHz)	Ave. Power (dBm)	Power Drift (dB)	Tune-Up Limit (dBm)	Meas. SAR_{10g} (W/kg)	Scaling Factor	Reported SAR_{10g} (W/kg)
13	WCDMA Band I	Front	9750	1950.0	22.10	-0.18	22.5	**0.201**	1.096	0.220
	WCDMA Band I	Back	9750	1950.0	22.10	-0.12	22.5	0.173	1.096	0.190
	WCDMA Band I	Left	9750	1950.0	22.10	0.11	22.5	0.072	1.096	0.079
	WCDMA Band I	Right	9750	1950.0	22.10	-0.31	22.5	0.078	1.096	0.085
	WCDMA Band I	Bottom	9750	1950.0	22.10	-0.16	22.5	0.170	1.096	0.186
	WCDMA Band I	Front	9612	1922.4	22.13	0.07	22.5	0.166	1.089	0.181
	WCDMA Band I	Front	9888	1977.6	22.07	-0.16	22.5	0.183	1.104	0.202
	WCDMA Band VIII	Front	2788	897.6	22.15	-0.02	22.5	0.390	1.084	0.423
14	WCDMA Band VIII	Back	2788	897.6	22.15	-0.04	22.5	**0.552**	1.084	0.598
	WCDMA Band VIII	Left	2788	897.6	22.15	-0.21	22.5	0.049	1.084	0.053
	WCDMA Band VIII	Right	2788	897.6	22.15	0.03	22.5	0.041	1.084	0.044
	WCDMA Band VIII	Bottom	2788	897.6	22.15	-0.05	22.5	0.092	1.084	0.100
	WCDMA Band VIII	Back	2712	882.4	22.12	0.09	22.5	0.516	1.091	0.563
	WCDMA Band VIII	Back	2863	912.6	22.11	-0.27	22.5	0.489	1.094	0.535
SAR LIMIT Uncontrolled Exposure/General Population					**2.0 W/kg (mW/g) Averaged over 10g**					

➢ LTE Body SAR

Plot No.	Band/Mode	Test Position	CH.	Freq. (MHz)	Ave. Power (dBm)	Power Drift (dB)	Tune-Up Limit (dBm)	Meas. SAR_{10g} (W/kg)	Scaling Factor	Reported SAR_{10g} (W/kg)
	LTE Band 1 /1RB#0 20M	Front	18300	1950.0	23.28	-0.21	23.5	0.215	1.052	0.226
15	LTE Band 1 /1RB#0 20M	Back	18300	1950.0	23.28	-0.06	23.5	**0.219**	1.052	0.23
	LTE Band 1 /1RB#0 20M	Left	18300	1950.0	23.28	-0.13	23.5	0.083	1.052	0.087
	LTE Band 1 /1RB#0 20M	Right	18300	1950.0	23.28	-0.19	23.5	0.065	1.052	0.068
	LTE Band 1 /1RB#0 20M	Bottom	18300	1950.0	23.28	-0.20	23.5	0.141	1.052	0.148
	LTE Band 1 /1RB#0 20M	Back	18100	1930.0	23.25	-0.06	23.5	0.192	1.059	0.203
	LTE Band 1 /1RB#0 20M	Back	18500	1970.0	23.32	0.11	23.5	0.210	1.042	0.219
	LTE Band 3 /1RB#0 20M	Front	19575	1747.5	23.33	-0.01	23.5	0.481	1.040	0.500
16	LTE Band 3 /1RB#0 20M	Back	19575	1747.5	23.33	-0.10	23.5	**0.702**	1.040	0.730
	LTE Band 3 /1RB#0 20M	Left	19575	1747.5	23.33	-0.18	23.5	0.196	1.040	0.204
	LTE Band 3 /1RB#0 20M	Right	19575	1747.5	23.33	-0.23	23.5	0.135	1.040	0.140
	LTE Band 3 /1RB#0 20M	Bottom	19575	1747.5	23.33	-0.24	23.5	0.569	1.040	0.592
	LTE Band 3 /1RB#0 20M	Back	19300	1720.0	22.81	0.15	23.0	0.654	1.045	0.683
	LTE Band 3 /1RB#0 20M	Back	19850	1775.0	23.23	-0.01	23.5	0.677	1.064	0.720
	LTE Band 7 /1RB#0 20M	Front	21100	2535.0	23.14	-0.09	23.5	0.140	1.086	0.152
	LTE Band 7 /1RB#0 20M	Back	21100	2535.0	23.14	0.05	23.5	0.192	1.086	0.209
	LTE Band 7 /1RB#0 20M	Left	21100	2535.0	23.14	0.09	23.5	0.096	1.086	0.104
	LTE Band 7 /1RB#0 20M	Right	21100	2535.0	23.14	-0.18	23.5	0.058	1.086	0.063
17	LTE Band 7 /1RB#0 20M	Bottom	21100	2535.0	23.14	-0.04	23.5	**0.313**	1.086	0.340
	LTE Band 7 /1RB#0 20M	Bottom	20850	2510.0	22.91	-0.10	23.0	0.283	1.021	0.289
	LTE Band 7 /1RB#0 20M	Bottom	21350	2560.0	23.28	0.07	23.5	0.306	1.052	0.322
	LTE Band 8 /1RB#0 10M	Front	21625	897.5	23.57	-0.02	24.0	0.394	1.104	0.435
18	LTE Band 8 /1RB#0 10M	Back	21625	897.5	23.57	-0.07	24.0	**0.430**	1.104	0.475
	LTE Band 8 /1RB#0 10M	Left	21625	897.5	23.57	0.21	24.0	0.102	1.104	0.113
	LTE Band 8 /1RB#0 10M	Right	21625	897.5	23.57	-0.12	24.0	0.078	1.104	0.086
	LTE Band 8 /1RB#0 10M	Bottom	21625	897.5	23.57	-0.23	24.0	0.092	1.104	0.102
	LTE Band 8 /1RB#0 10M	Back	21500	885.0	23.49	0.06	23.5	0.364	1.002	0.365
	LTE Band 8 /1RB#0 10M	Back	21750	910.0	23.60	-0.13	24.0	0.410	1.096	0.449

	LTE Band 20 /1RB#0 20M	Front	24300	847.0	22.82	0.02	23.0	0.308	1.042	0.321
19	LTE Band 20 /1RB#0 20M	Back	24300	847.0	22.82	-0.00	23.0	**0.370**	1.042	0.386
	LTE Band 20 /1RB#0 20M	Left	24300	847.0	22.82	-0.20	23.0	0.132	1.042	0.138
	LTE Band 20 /1RB#0 20M	Right	24300	847.0	22.82	0.18	23.0	0.098	1.042	0.102
	LTE Band 20 /1RB#0 20M	Bottom	24300	847.0	22.82	-0.01	23.0	0.057	1.042	0.059
	LTE Band 20 /1RB#0 20M	Back	24250	842.0	22.72	-0.17	23.0	0.324	1.067	0.346
	LTE Band 20 /1RB#0 20M	Back	24350	852.0	22.71	0.09	23.0	0.351	1.069	0.375
SAR LIMIT Uncontrolled Exposure/General Population					**2.0 W/kg (mW/g) Averaged over 10g**					

➢ **WLAN Body SAR**

Plot No.	Band/Mode	Test Position	CH.	Freq. (MHz)	Ave. Power (dBm)	Power Drift (dB)	Tune-Up Limit (dBm)	Meas. SAR_{10g} (W/kg)	Scaling Factor	D.C Factor	Reported SAR_{10g} (W/kg)
	802.11b	Front	07	2442	14.94	-0.18	15.0	0.045	1.014	1.04	0.047
20	802.11b	Back	07	2442	14.94	-0.02	15.0	**0.051**	1.014	1.04	0.054
	802.11b	Left	07	2442	14.94	-0.15	15.0	0.017	1.014	1.04	0.018
	802.11b	Top	07	2442	14.94	-0.38	15.0	0.039	1.014	1.04	0.041
	802.11b	Back	01	2412	14.94	-0.17	15.0	0.035	1.014	1.04	0.037
	802.11b	Back	13	2472	15.08	-0.06	15.5	0.042	1.102	1.04	0.048
SAR LIMIT Uncontrolled Exposure/General Population					**2.0 W/kg (mW/g) Averaged over 10g**						

Note:

1. Body-worn SAR testing was performed at 5mm separation, and this distance is determined by the handset manufacturer that there will be body-worn accessories that users may acquire at the time of equipment certification, to enable users to purchase aftermarket body-worn accessories with the required minimum separation.
2. Determination of the worst-case configuration and all configurations with less than 3 dB of applicable limits.
3. When 10g SAR ≤ 1.0 W/kg, testing for low and high channel is optional.
4. According to EN62209-1 section 6.3, the drift should be kept within ±5%, the units of Power Drift Value measured are V/m, converting to dB should be kept in ±0.42 dB.

16.3 SAR Simultaneous Transmission Analysis

➢ **Head Simultaneous Transmission**

WWAN Mode	Position	WWAN SAR_{10g} (W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)		WWAN Mode	Position	WWAN SAR_{10g} (W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)
GSM900	Right Cheek	0.420	0.078	0.498		GSM 1800	Right Cheek	0.221	0.078	0.299
	Right Tilted	0.156	0.069	0.225			Right Tilted	0.095	0.069	0.164
	Left Cheek	0.393	0.100	0.493			Left Cheek	0.246	0.100	0.346
	Left Tilted	0.142	0.088	0.230			Left Tilted	0.105	0.088	0.193

WWAN Mode	Position	WWAN SAR_{10g}(W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)		WWAN Mode	Position	WWAN SAR_{10g}(W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)
WCDMA Band I	Right Cheek	0.087	0.078	0.165		WCDMA Band VIII	Right Cheek	0.397	0.078	0.475
	Right Tilted	0.034	0.069	0.103			Right Tilted	0.150	0.069	0.219
	Left Cheek	0.128	0.100	0.228			Left Cheek	0.360	0.100	0.460
	Left Tilted	0.067	0.088	0.155			Left Tilted	0.137	0.088	0.225

WWAN Mode	Position	WWAN SAR_{10g}(W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)		WWAN Mode	Position	WWAN SAR_{10g}(W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)
LTE Band 1	Right Cheek	0.072	0.078	0.150		LTE Band 3	Right Cheek	0.189	0.078	0.267
	Right Tilted	0.029	0.069	0.098			Right Tilted	0.089	0.069	0.158
	Left Cheek	0.082	0.100	0.182			Left Cheek	0.303	0.100	0.403
	Left Tilted	0.034	0.088	0.122			Left Tilted	0.137	0.088	0.225

WWAN Mode	Position	WWAN SAR_{10g}(W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)		WWAN Mode	Position	WWAN SAR_{10g}(W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)
LTE Band 7	Right Cheek	0.098	0.078	0.176		LTE Band 8	Right Cheek	0.445	0.078	0.523
	Right Tilted	0.045	0.069	0.114			Right Tilted	0.190	0.069	0.259
	Left Cheek	0.092	0.100	0.192			Left Cheek	0.402	0.100	0.502
	Left Tilted	0.038	0.088	0.126			Left Tilted	0.182	0.088	0.270

WWAN Mode	Position	WWAN SAR_{10g}(W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)
LTE Band 20	Right Cheek	0.249	0.078	0.327
	Right Tilted	0.106	0.069	0.175
	Left Cheek	0.232	0.100	0.332
	Left Tilted	0.098	0.088	0.186

➢ **Body worn Simultaneous Transmission**

WWAN Mode	Position	WWAN SAR_{10g} (W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)	WWAN Mode	Position	WWAN SAR_{10g} (W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)
GSM900	Front	0.582	0.047	0.629	GSM 1800	Front	0.448	0.047	0.495
	Back	1.675	0.054	1.729		Back	1.240	0.054	1.294
	Left	0.273	0.018	0.291		Left	0.404	0.018	0.422
	Right	0.179	/	0.179		Right	0.370	/	0.370
	Top	/	0.041	0.041		Top	/	0.041	0.041
	Bottom	0.175	/	0.175		Bottom	0.779	/	0.779

WWAN Mode	Position	WWAN SAR_{10g} (W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)	WWAN Mode	Position	WWAN SAR_{10g} (W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)
WCDMA Band I	Front	0.220	0.047	0.267	WCDMA Band VIII	Front	0.423	0.047	0.47
	Back	0.190	0.054	0.244		Back	0.598	0.054	0.652
	Left	0.079	0.018	0.097		Left	0.053	0.018	0.071
	Right	0.085	/	0.085		Right	0.044	/	0.044
	Top	/	0.041	0.041		Top	/	0.041	0.041
	Bottom	0.186	/	0.186		Bottom	0.100	/	0.100

WWAN Mode	Position	WWAN SAR_{10g} (W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)	WWAN Mode	Position	WWAN SAR_{10g} (W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)
LTE Band 1	Front	0.226	0.047	0.273	LTE Band 3	Front	0.500	0.047	0.547
	Back	0.230	0.054	0.284		Back	0.730	0.054	0.784
	Left	0.087	0.018	0.105		Left	0.204	0.018	0.222
	Right	0.068	/	0.068		Right	0.140	/	0.14
	Top	/	0.041	0.041		Top	/	0.041	0.041
	Bottom	0.148	/	0.148		Bottom	0.592	/	0.592

WWAN Mode	Position	WWAN SAR_{10g} (W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)	WWAN Mode	Position	WWAN SAR_{10g} (W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)
LTE Band 7	Front	0.152	0.047	0.199	LTE Band 8	Front	0.435	0.047	0.482
	Back	0.209	0.054	0.263		Back	0.475	0.054	0.529
	Left	0.104	0.018	0.122		Left	0.113	0.018	0.131
	Right	0.063	/	0.063		Right	0.086	/	0.086
	Top	/	0.041	0.041		Top	/	0.041	0.041
	Bottom	0.340	/	0.340		Bottom	0.102	/	0.102

WWAN Mode	Position	WWAN SAR_{10g} (W/kg)	WLAN SAR_{10g} (W/kg)	ΣSAR (W/kg)
LTE Band 20	Front	0.321	0.047	0.368
	Back	0.386	0.054	0.440
	Left	0.138	0.018	0.156
	Right	0.102	/	0.102
	Top	/	0.041	0.041
	Bottom	0.059	/	0.059

Note:

1. WLAN 2.4GHz Band and Bluetooth share the same antenna, and cannot transmit simultaneously.
2. GSM/WCDMA/LTE shares the same antenna, and cannot transmit simultaneously.
3. According to EN 62209-2 Annex K, the threshold power level available to the secondary transmitter ($P_{available}$) is to calculate it from the measured peak spatial-average SAR of the primary transmitter (SAR_1) according to the equation: $P_{available} = P_{th,m} \times (SAR_{lim} - SAR_1) / SAR_{lim}$. If the output power of the secondary transmitter is less than $P_{available}$, SAR measurement for the secondary transmitter is not necessary. Therefore, $P_{available}$=20× (2.0-1.675) / 2.0=3.25mW=5.12dBm. Cuz$P_{BT, MAX}$=3.81dBm<5.12dBm, the SAR measurement for BT is not necessary. The consideration of simultaneous transmission of BT is not necessary.

- **Simultaneous Transmission Conclusion**

The above numerical summed SAR results for all the case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required.

16.4 Measurement Uncertainty

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type A evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A Type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in below Table.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor	1/k(b)	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

Uncertainty Component	Uncertainty Value	Probability Distribution	Divisor	Ci (1 g)	Ci (10 g)	Standard Uncertainty (1 g)	Standard Uncertainty (10 g)
Measurement System							
Probe Calibration	±7.4%	N	1	1	1	±7.4%	±7.4%
Axial Isotropy	±1.2%	R	$\sqrt{3}$	0.7	0.7	±0.49%	±0.49%
Hemispherical Isotropy	±3.2%	R	$\sqrt{3}$	0.7	0.7	±1.29%	±1.29%
Boundary Effects	±1.0%	R	$\sqrt{3}$	1	1	±0.58%	±0.58%
Linearity	±0.9%	R	$\sqrt{3}$	1	1	±0.52%	±0.52%
System Detection Limits	±0.25%	R	$\sqrt{3}$	1	1	±0.14%	±0.14%
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%
Response Time	±0.8%	R	$\sqrt{3}$	1	1	±0.46%	±0.46%
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.73%	±1.73%
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.73%	±1.73%
Probe Positioner	±0.4%	R	$\sqrt{3}$	1	1	±0.23%	±0.23%
Probe Positioning	±2.9%	R	$\sqrt{3}$	1	1	±1.68%	±1.68%
Max. SAR Eval.	±1.0%	R	$\sqrt{3}$	1	1	±0.58%	±0.58%
Test Sample Related							
Device Positioning	±4.6%	N	1	1	1	±4.6%	±4.6%
Device Holder	±5.2%	N	1	1	1	±5.2%	±5.2%
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.89%	±2.89%
Phantom and Setup							
Phantom Uncertainty	±4.0%	R	$\sqrt{3}$	1	1	±2.31%	±2.31%
Liquid conductivity (measured value)	±3.51%	N	1	0.78	0.71	±2.74%	±2.49%
Liquid dielectric constant (measured value)	±3.4%	N	1	0.23	0.26	±0.78%	±0.88%
Liquid Conductivity - Temperature Uncertainty	±1.6%	R	$\sqrt{3}$	0.78	0.71	±0.72%	±0.66%
Liquid Dielectric Constant - Temperature Uncertainty	±0.9%	R	$\sqrt{3}$	0.23	0.26	±0.12%	±0.14%
Combined Standard Uncertainty						±11.61%	±11.55%
Expanded Uncertainty (95% Confidence Level, k = 2)						±23.23%	±23.10%

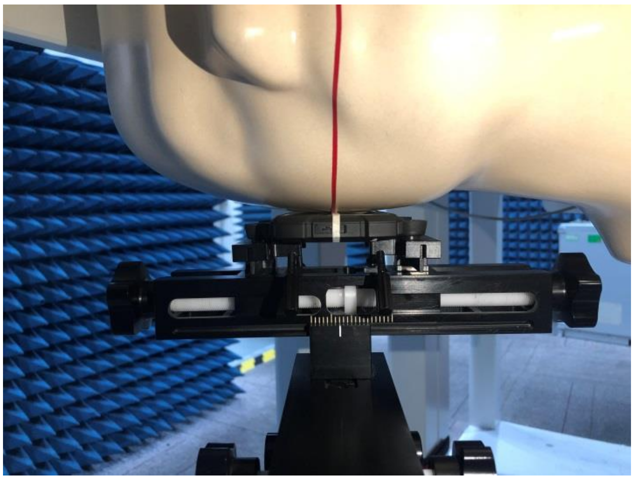
Uncertainty Budget for frequency range 300 MHz to 3 GHz

16.5 Measurement Conclusion

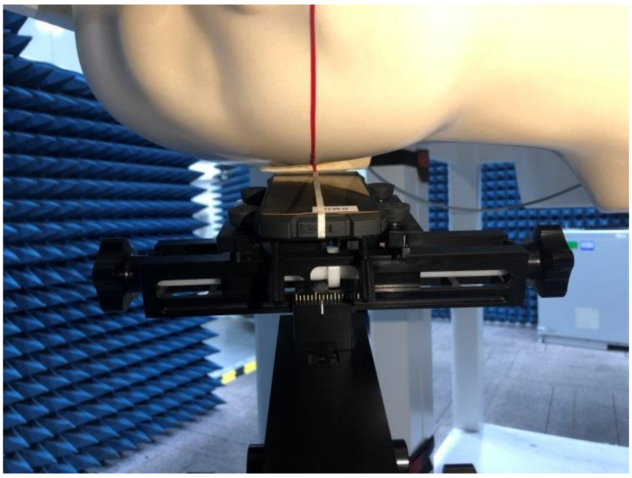
The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the CE, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested. Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend 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 various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

Appendix A: EUT Photos

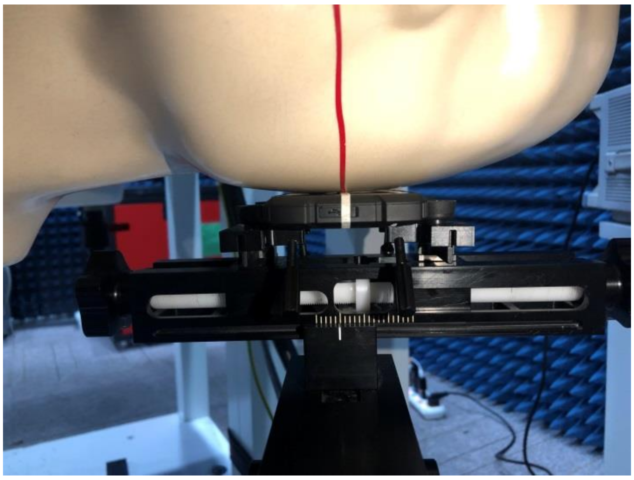
Appendix B: Test Setup Photos



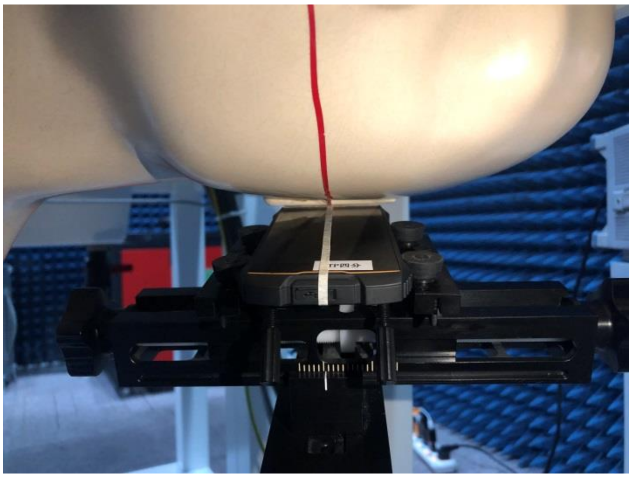
Right Cheek



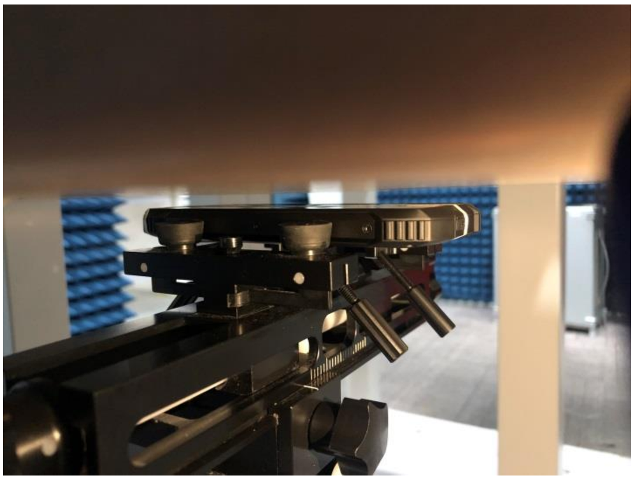
Right Tilted



Left Cheek



Left Tilted



Body worn – Front
(Test distance: 5mm, Thickness of DUT: 12mm)

Body worn – Back
(Test distance: 5mm, Thickness of DUT: 12mm)


Body worn –Left
(Test distance: 5mm, Thickness of DUT: 12mm)


Body worn –Right
(Test distance: 5mm, Thickness of DUT: 12mm)


Body worn –Top
(Test distance: 5mm, Thickness of DUT: 12mm)


Body worn –Bottom
(Test distance: 5mm, Thickness of DUT: 12mm)

Appendix C: Plots of SAR System Check

Test Laboratory: CCIS Date/Time: 10.12.2019 08:06:25

DUT: Dipole 835 MHz; Type: D835V2; Serial: SN:4d154

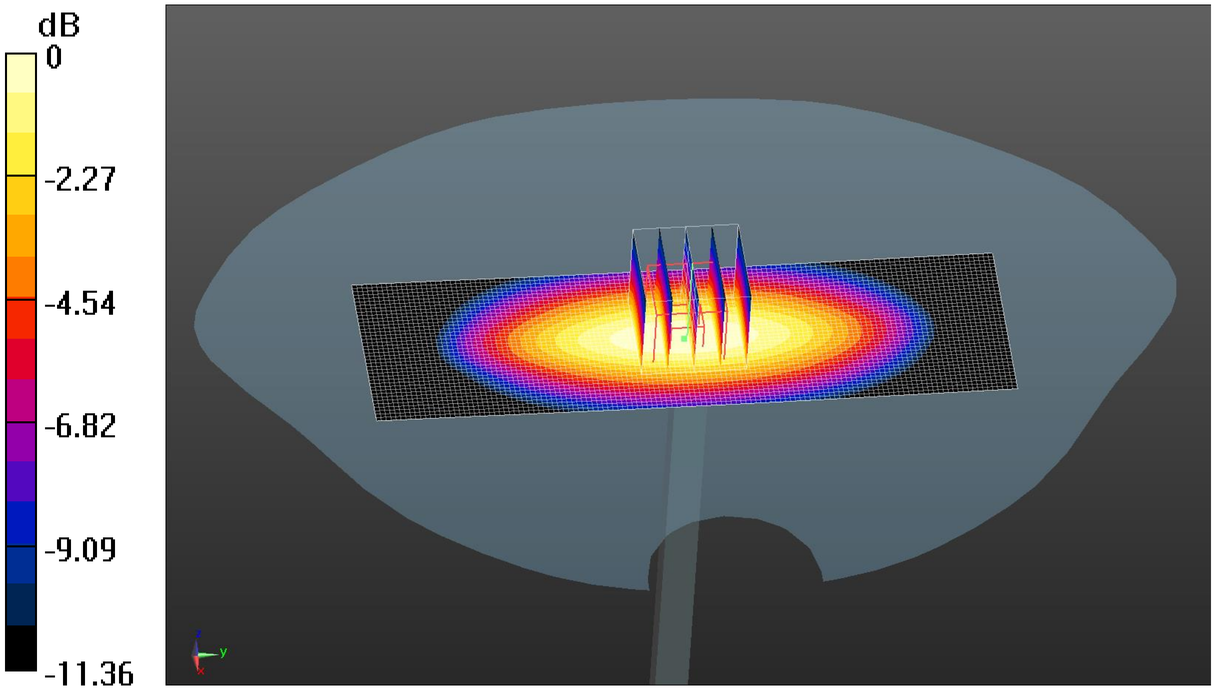
Communication System: UID 0, CW (0); Frequency: 835 MHz; Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.913 S/m; ε_r = 41.258; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(9.67, 9.67, 9.67); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequency 835 MHz Head Tissue/d=15mm, Pin=80 mW, dist=2.0mm (EX-Probe)/Area Scan (41x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.12 W/kg

System Performance Check at Frequency 835 MHz Head Tissue/d=15mm, Pin=80 mW, dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7) (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 32.68 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 1.21 W/kg
SAR(1 g) = 0.790 W/kg; SAR(10 g) = 0.521 W/kg
Maximum value of SAR (measured) = 1.07 W/kg



0 dB = 1.07 W/kg = 0.29 dBW/kg

Test Laboratory: CCIS Date/Time: 10.09.2019 08:04:52

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d175

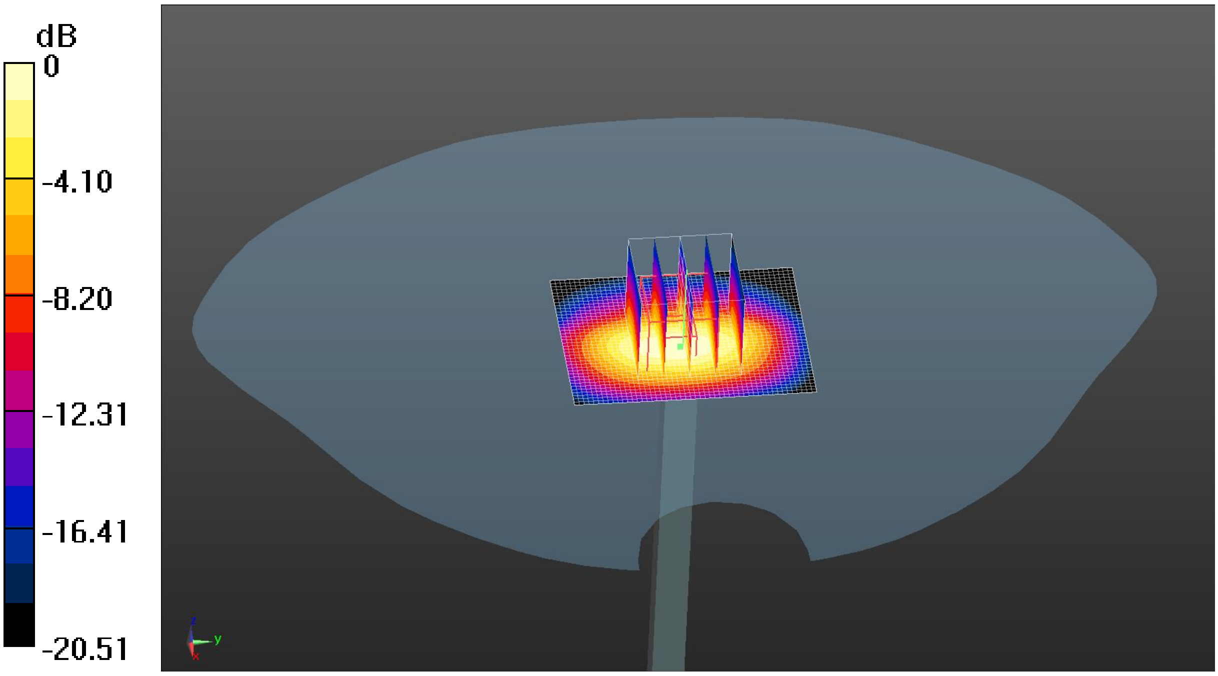
Communication System: UID 0, CW (0); Frequency: 1900 MHz; Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.416 S/m; ε_r = 39.621; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(8.17, 8.17, 8.17); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequency 1900MHz Head Tissue/d=10mm, Pin=40 mW, dist=2.0mm (EX-Probe)/Area Scan (41x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.68 W/kg

System Performance Check at Frequency 1900MHz Head Tissue/d=10mm, Pin=40 mW, dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7) (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 40.34 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.39 W/kg
SAR(1 g) = 1.63 W/kg; SAR(10 g) = 0.835 W/kg
Maximum value of SAR (measured) = 2.44 W/kg



0 dB = 2.44 W/kg = 3.87 dBW/kg

Test Laboratory: CCIS Date/Time: 10.21.2019 08:10:04

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: SN:910

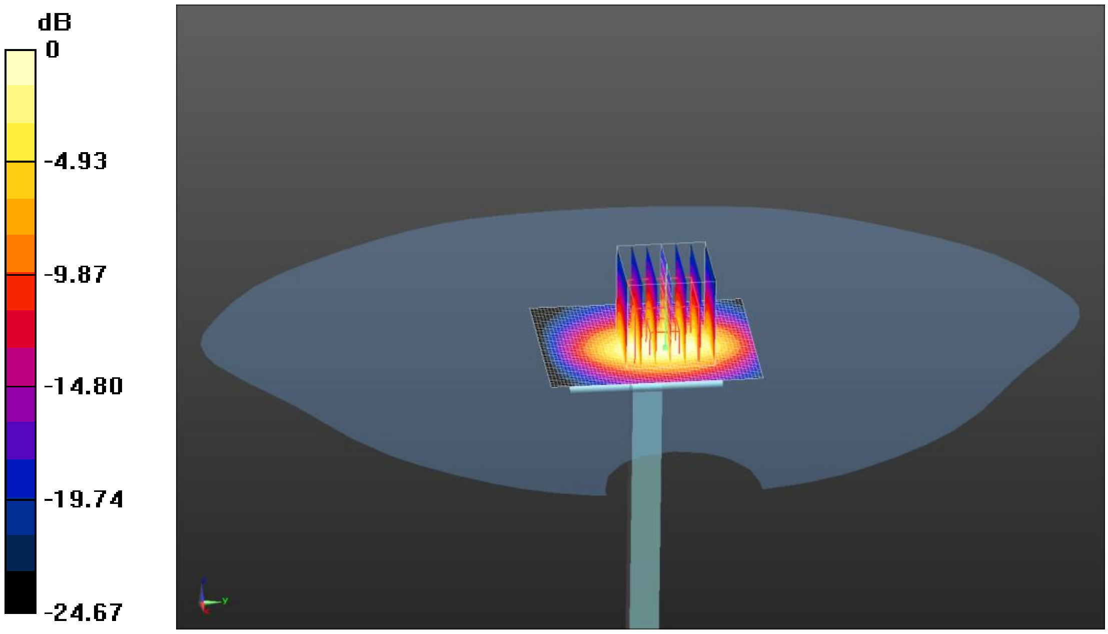
Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.832 S/m; ε_r = 39.702; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(7.54, 7.54, 7.54); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequency 2450MHz Head Tissue/d=10mm, Pin=40 mW, dist=2.0mm (EX-Probe)/Area Scan (51x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 3.71 W/kg

System Performance Check at Frequency 2450MHz Head Tissue/d=10mm, Pin=40 mW, dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 40.02 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 4.52 W/kg
SAR(1 g) = 2.17 W/kg; SAR(10 g) = 0.982 W/kg
Maximum value of SAR (measured) = 3.45 W/kg



0 dB = 3.45 W/kg = 5.38 dBW/kg

Test Laboratory: CCIS Date/Time: 10.21.2019 08:29:50

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: SN:1114

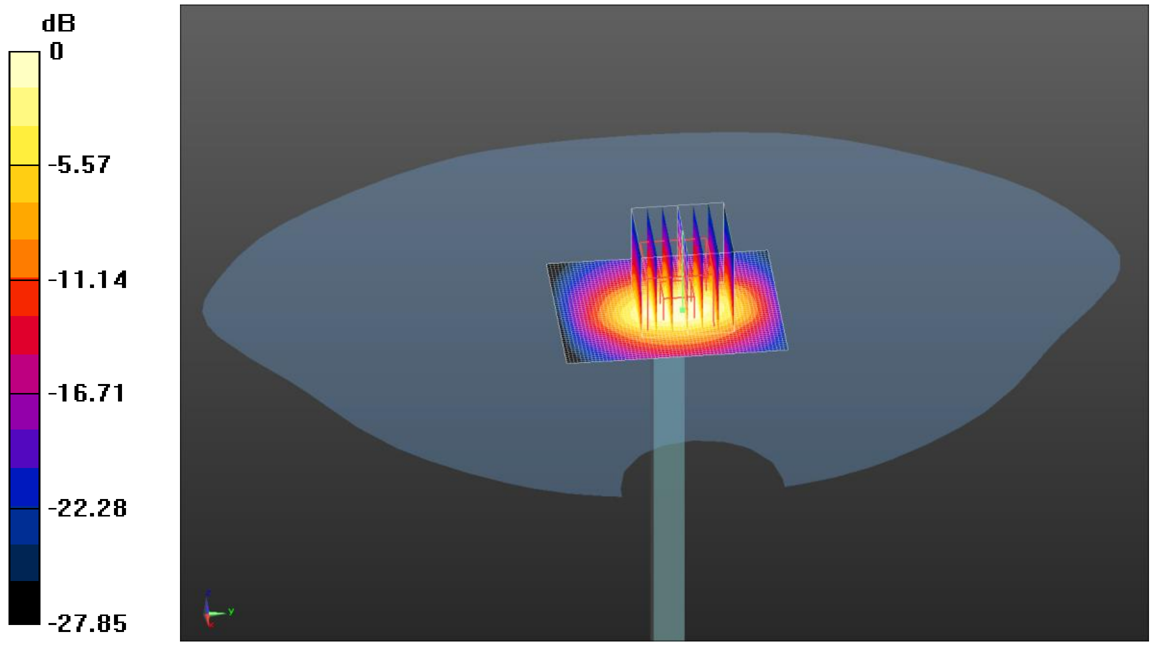
Communication System: UID 0, CW (0); Frequency: 2600 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2600 MHz; σ = 2.009 S/m; ε_r = 38.472; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 – SN3924; ConvF(7.3, 7.3, 7.3); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequency 2600MHz Head Tissue/d=10mm, Pin=40 mW, dist=2.0mm (EX-Probe)/Zoom Scan(7X7X7) (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 43.82 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 5.01 W/kg
SAR(1 g) = 2.29 W/kg; SAR(10 g) = 0.983 W/kg
Maximum value of SAR (measured) = 3.96 W/kg

System Performance Check at Frequency 2600MHz Head Tissue/d=10mm, Pin=40 mW, dist=2.0mm (EX-Probe)/Area Scan (51x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 4.30 W/kg



0 dB = 4.30 W/kg = 6.33 dBW/kg

Appendix D: Plots of SAR Test Data

Test Laboratory: CCIS Date/Time: 10.12.2019 09:05:29

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

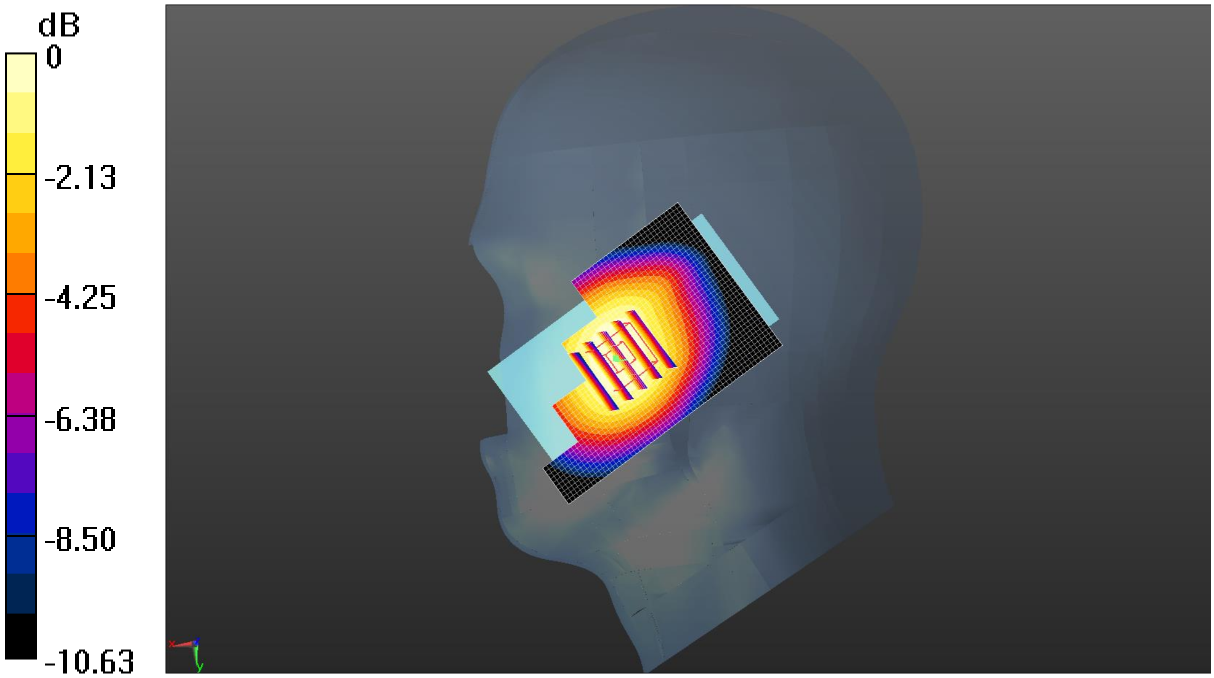
Communication System: UID 0, GSM (0); Frequency: 902 MHz; Duty Cycle: 1:8.30042
Medium parameters used (interpolated): f = 902 MHz; σ = 0.998 S/m; ε_r = 40.637; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(9.69, 9.69, 9.69); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

GSM 900 Right Cheek/Middle Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.932 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 0.722 W/kg
SAR(1 g) = 0.527 W/kg; SAR(10 g) = 0.387 W/kg
Maximum value of SAR (measured) = 0.655 W/kg

GSM 900 Right Cheek/Middle Channel/Area Scan (41x61x1): Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 0.644 W/kg



0 dB = 0.644 W/kg = -1.91 dBW/kg

Test Laboratory: CCIS Date/Time: 10.09.2019 13:28:40

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

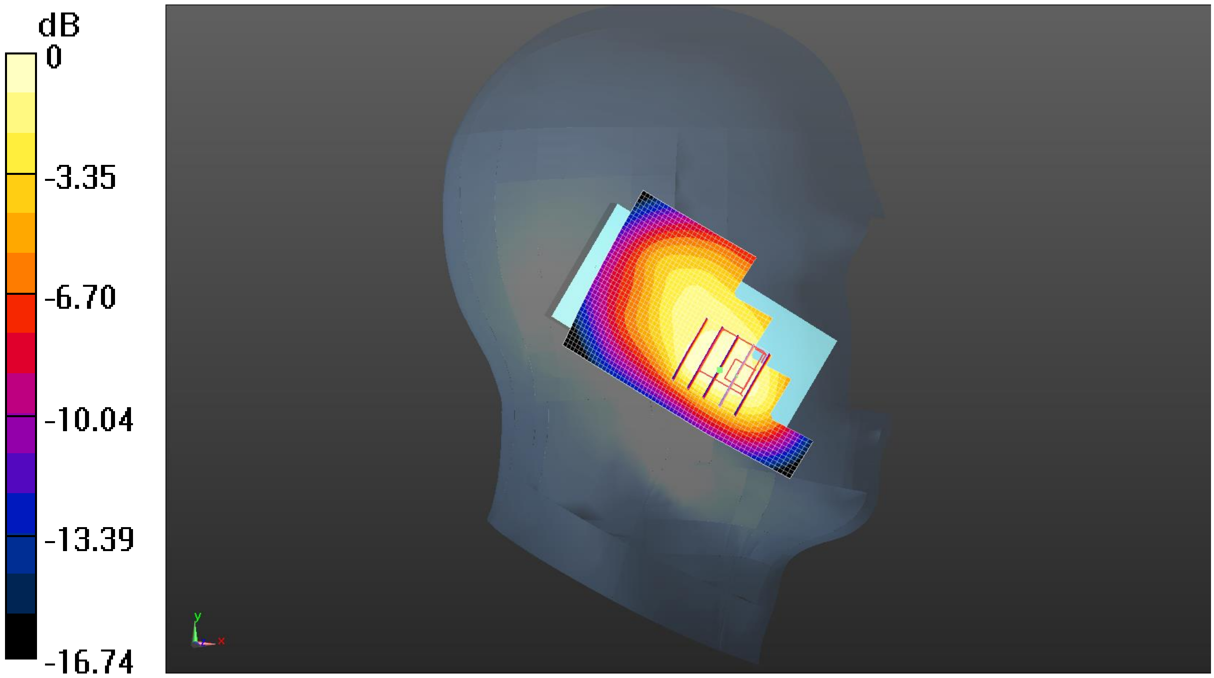
Communication System: UID 0, GSM (0); Frequency: 1747.8 MHz; Duty Cycle: 1:8.30042
Medium parameters used (interpolated): f = 1747.8 MHz; σ = 1.357 S/m; ε_r = 40.762; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(8.4, 8.4, 8.4); Calibrated: 08.30.2019;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

GSM 1800 Left Cheek/Middle Channel/Area Scan (41x61x1): Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 0.592 W/kg

GSM 1800 Left Cheek/Middle Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.642 V/m; Power Drift = -0.34 dB
Peak SAR (extrapolated) = 0.664 W/kg
SAR(1 g) = 0.388 W/kg; SAR(10 g) = 0.232 W/kg
Maximum value of SAR (measured) = 0.531 W/kg



0 dB = 0.531 W/kg = -2.75 dBW/kg

Test Laboratory: CCIS　　Date/Time: 10.09.2019 18:42:00

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

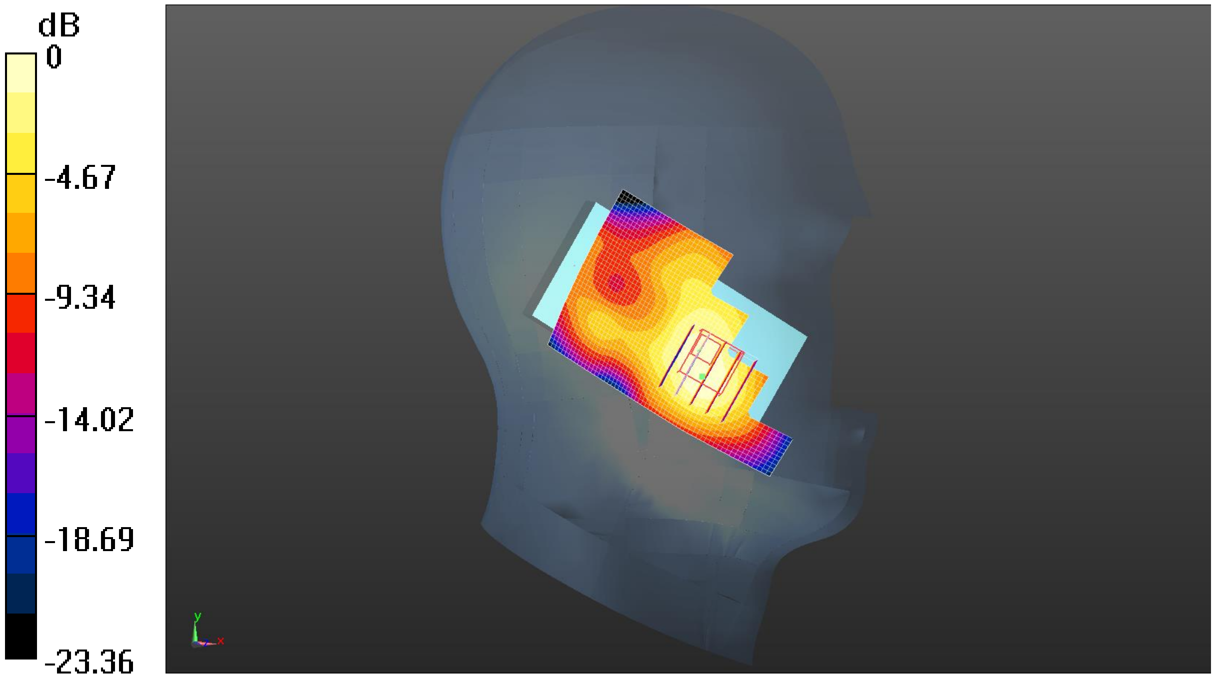
Communication System: UID 0, UMTS-FDD(WCDMA) (0); Frequency: 1950 MHz; Duty Cycle: 1:1
Medium parameters used: f = 1950 MHz; σ = 1.425 S/m; ε_r = 39.548; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(8.17, 8.17, 8.17); Calibrated: 08.30.2019;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

WCDMA 2100 Left Cheek/Middle Channel/Area Scan (41x61x1): Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 0.327 W/kg

WCDMA 2100 Left Cheek/Middle Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.315 V/m; Power Drift = 0.21 dB
Peak SAR (extrapolated) = 0.399 W/kg
SAR(1 g) = 0.224 W/kg; SAR(10 g) = 0.117 W/kg
Maximum value of SAR (measured) = 0.306 W/kg



0 dB = 0.306 W/kg = -5.14 dBW/kg

Test Laboratory: CCIS Date/Time: 10.12.2019 15:42:44

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

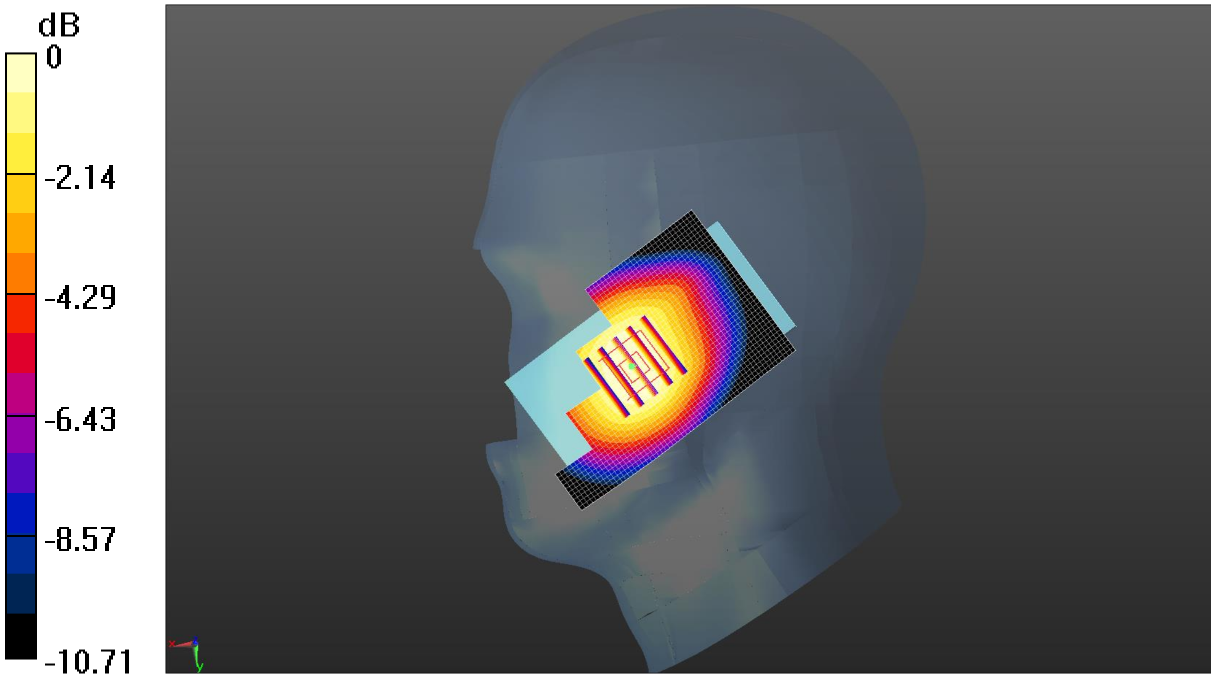
Communication System: UID 0, UMTS-FDD(WCDMA) (0); Frequency: 897.6 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 897.6 MHz; σ = 0.986 S/m; ε_r = 40.759; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(9.69, 9.69, 9.69); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

WCDMA 900 Right Cheek/Middle Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.250 V/m; Power Drift = -0.29 dB
Peak SAR (extrapolated) = 0.691 W/kg
SAR(1 g) = 0.503 W/kg; SAR(10 g) = 0.366 W/kg
Maximum value of SAR (measured) = 0.626 W/kg

WCDMA 900 Right Cheek/Middle Channel/Area Scan (41x61x1): Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 0.614 W/kg



0 dB = 0.614 W/kg = -2.12 dBW/kg

Test Laboratory: CCIS Date/Time: 10.09.2019 19:58:07

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

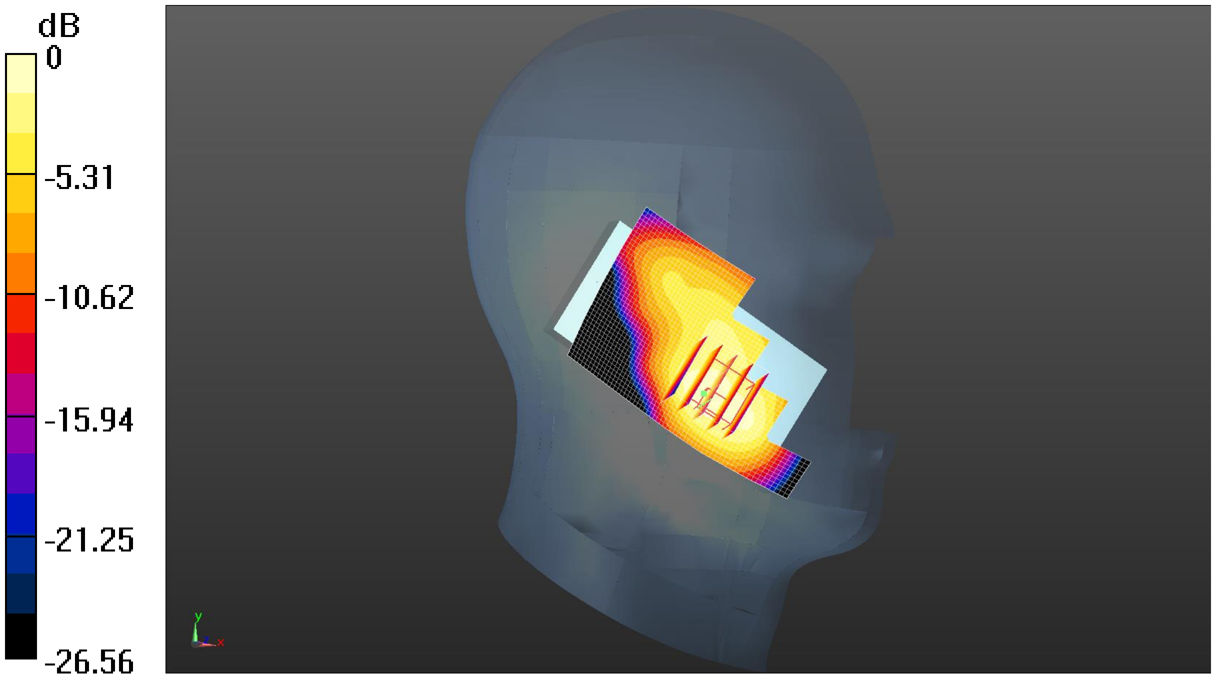
Communication System: UID 0, LTE-FDD(EU) (0); Frequency: 1950 MHz; Duty Cycle: 1:1
Medium parameters used: f = 1950 MHz; σ = 1.425 S/m; ε_r = 39.548; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(8.17, 8.17, 8.17); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

LTE Band 1 1RB(20MHz) Left Cheek/Middle Channel/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.768 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.237 W/kg
SAR(1 g) = 0.132 W/kg; SAR(10 g) = 0.078 W/kg
Maximum value of SAR (measured) = 0.191 W/kg

LTE Band 1 1RB(20MHz) Left Cheek/Middle Channel/Area Scan (41x61x1):
Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 0.245 W/kg



0 dB = 0.245 W/kg = -6.11 dBW/kg

Test Laboratory: CCIS   Date/Time: 10.09.2019 23:21:28

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

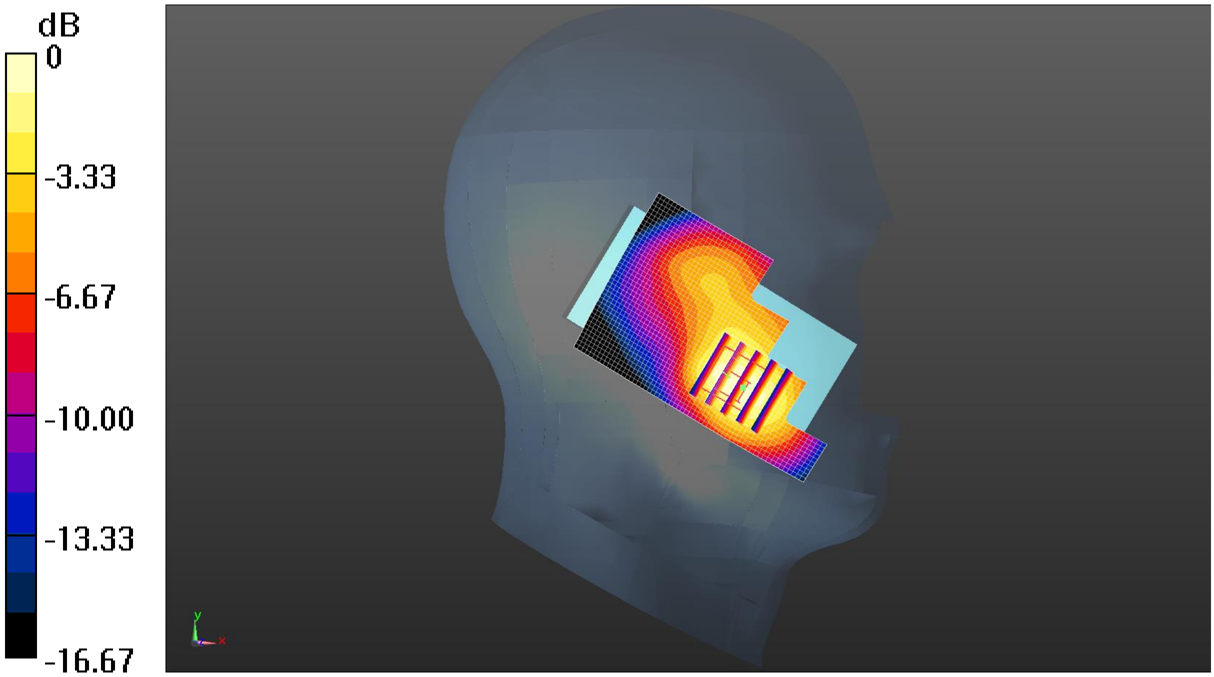
Communication System: UID 0, LTE-FDD(EU) (0); Frequency: 1747.5 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1747.5 MHz; σ = 1.357 S/m; ε_r = 40.762; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(8.4, 8.4, 8.4); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

LTE Band 3 1RB(20MHz) Body Front/Middle Channel/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.257 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 0.783 W/kg
SAR(1 g) = 0.477 W/kg; SAR(10 g) = 0.291 W/kg
Maximum value of SAR (measured) = 0.636 W/kg

LTE Band 3 1RB(20MHz) Body Front/Middle Channel/Area Scan (41x61x1): Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 0.732 W/kg



0 dB = 0.732 W/kg = -1.35 dBW/kg

Test Laboratory: CCIS Date/Time: 10.21.2019 11:55:20

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

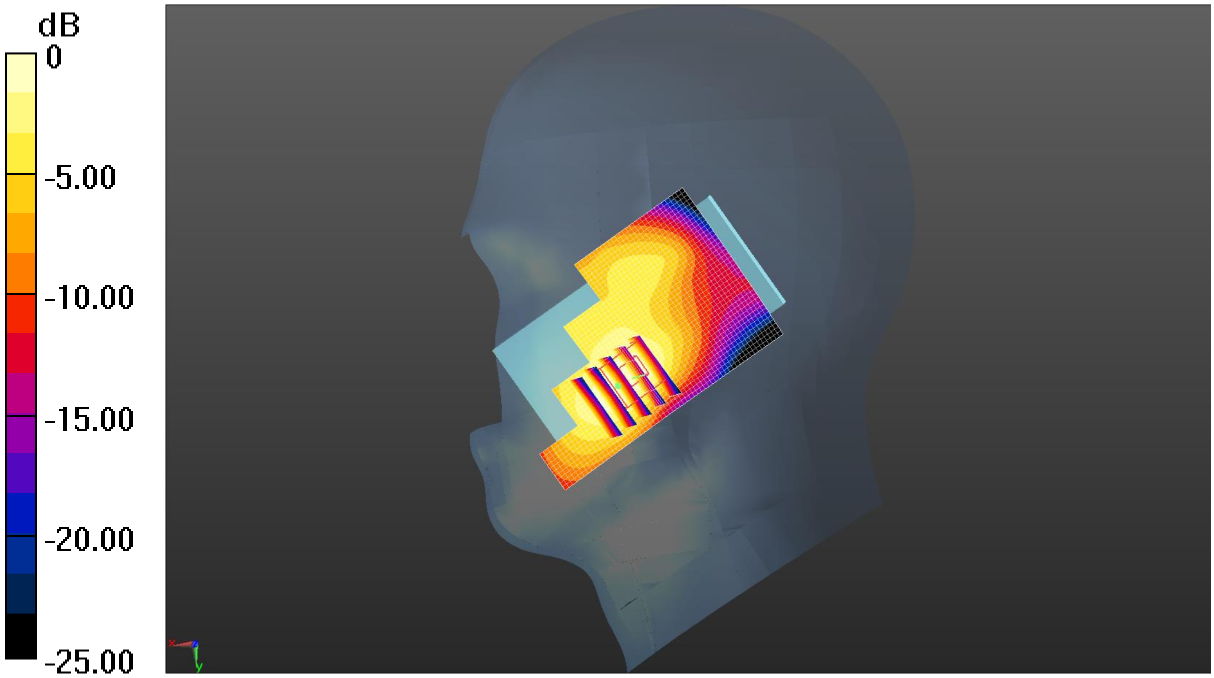
Communication System: UID 0, LTE-FDD(EU) (0); Frequency: 2535 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2535 MHz; σ = 1.943 S/m; ε_r = 38.926; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(7.54, 7.54, 7.54); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

LTE Band 7 1RB(20MHz) Right Cheek/Middle Channel/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.454 V/m; Power Drift = 0.24 dB
Peak SAR (extrapolated) = 0.310 W/kg
SAR(1 g) = 0.168 W/kg; SAR(10 g) = 0.090 W/kg
Maximum value of SAR (measured) = 0.253 W/kg

LTE Band 7 1RB(20MHz) Right Cheek/Middle Channel/Area Scan (41x61x1):
Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.269 W/kg



0 dB = 0.269 W/kg = -5.70 dBW/kg

Test Laboratory: CCIS Date/Time: 10.12.2019 16:56:57

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

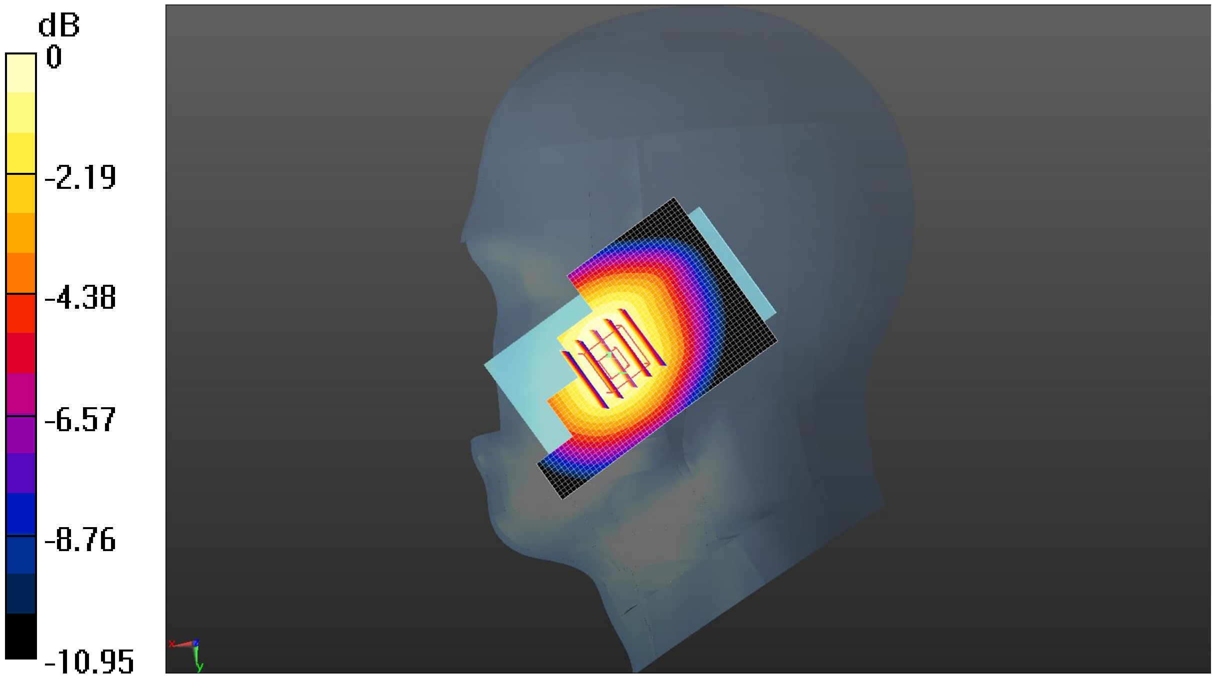
Communication System: UID 0, LTE-FDD(EU) (0); Frequency: 897.5 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 897.5 MHz; σ = 0.986 S/m; ε_r = 40.759; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(9.69, 9.69, 9.69); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

LTE Band 8 1RB(10MHz) Right Cheek/Middle Channel/Area Scan (41x61x1):
Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 0.672 W/kg

LTE Band 8 1RB(10MHz) Right Cheek/Middle Channel/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.151 V/m; Power Drift = -0.29 dB
Peak SAR (extrapolated) = 0.754 W/kg
SAR(1 g) = 0.553 W/kg; SAR(10 g) = 0.403 W/kg
Maximum value of SAR (measured) = 0.678 W/kg



0 dB = 0.678 W/kg = -1.69 dBW/kg

Test Laboratory: CCIS Date/Time: 10.12.2019 20:25:28

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

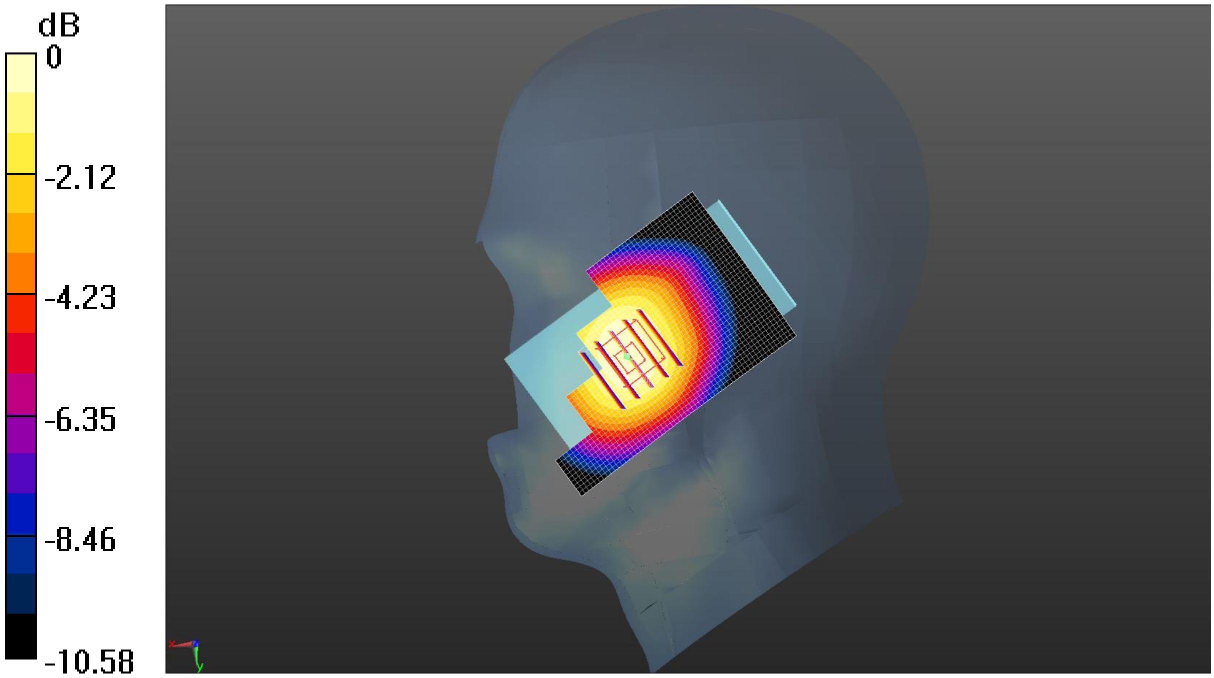
Communication System: UID 0, LTE-FDD(EU) (0); Frequency: 847 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 847 MHz; σ = 0.924 S/m; ε_r = 41.174; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(9.67, 9.67, 9.67); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

LTE Band 20 1RB(20MHz) Right Cheek/Middle Channel/Area Scan (41x61x1): Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 0.394 W/kg

LTE Band 20 1RB(20MHz) Right Cheek/Middle Channel/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.730 V/m; Power Drift = -0.29 dB
Peak SAR (extrapolated) = 0.442 W/kg
SAR(1 g) = 0.326 W/kg; SAR(10 g) = 0.239 W/kg
Maximum value of SAR (measured) = 0.402 W/kg



0 dB = 0.402 W/kg = -3.96 dBW/kg

Test Laboratory: CCIS Date/Time: 10.21.2019 16:02:42

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

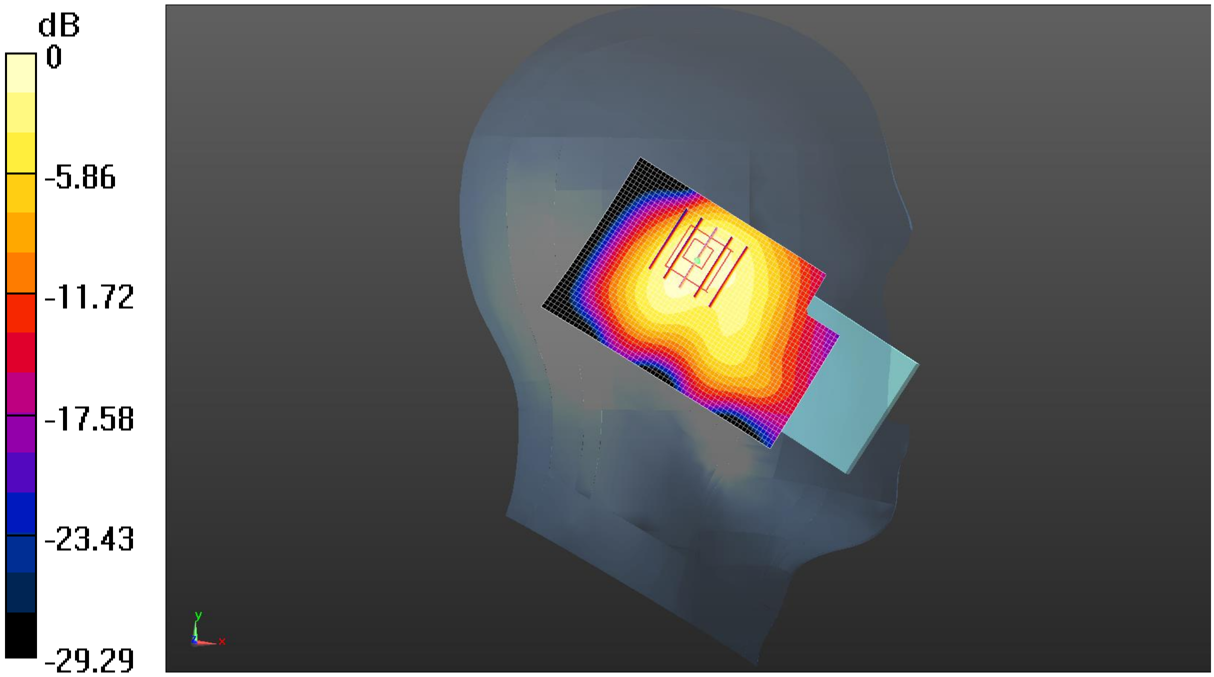
Communication System: UID 0, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps) (0);
Frequency: 2442 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2442 MHz; σ = 1.825 S/m; ε_r = 39.738; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(7.54, 7.54, 7.54); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

WIFI Left Cheek/Middle Channel/Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.400 W/kg

WIFI Left Cheek/Middle Channel/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.68 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.382 W/kg
SAR(1 g) = 0.184 W/kg; SAR(10 g) = 0.095 W/kg
Maximum value of SAR (measured) = 0.285 W/kg



0 dB = 0.285 W/kg = -5.45 dBW/kg

Test Laboratory: CCIS Date/Time: 10.12.2019 13:31:44

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

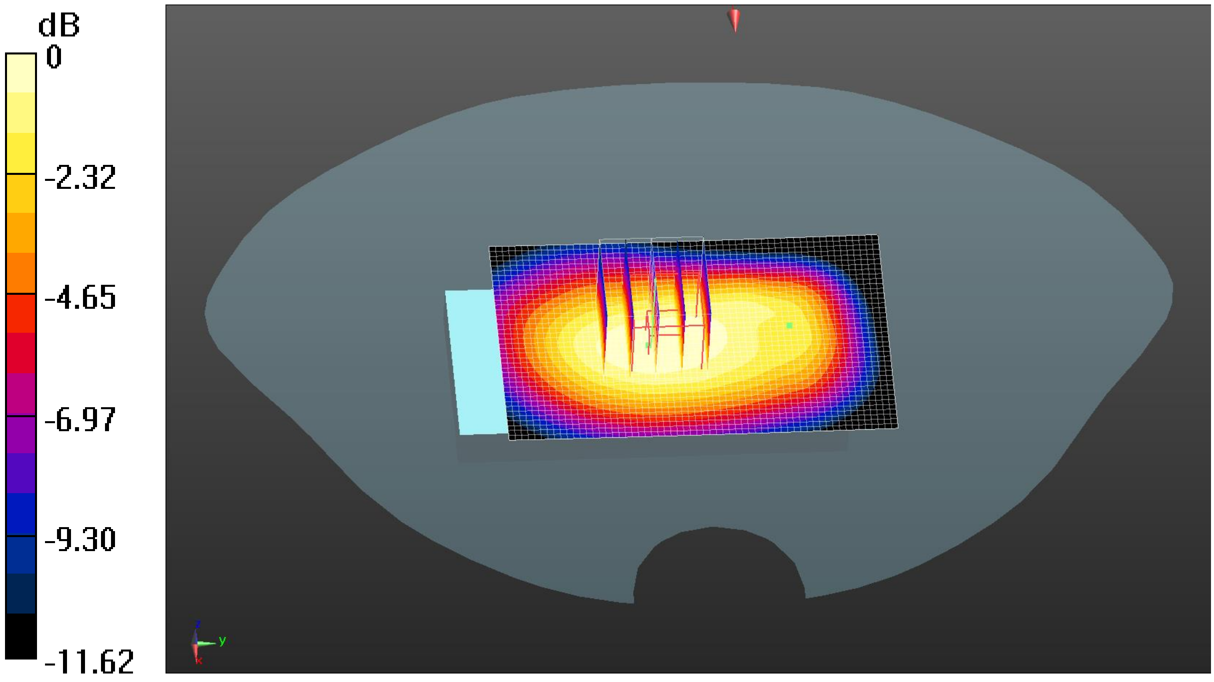
Communication System: UID 0, GPRS(4 Slots) (0); Frequency: 880.2 MHz; Duty Cycle: 1:1.99986
Medium parameters used (interpolated): f = 880.2 MHz; σ = 0.971 S/m; ε_r = 40.816; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(9.69, 9.69, 9.69); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

GPRS 900 4Slots Body Back/Low Channel/Area Scan (41x61x1): Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 2.96 W/kg

GPRS 900 4Slots Body Back/Low Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 56.48 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 3.33 W/kg
SAR(1 g) = 2.26 W/kg; SAR(10 g) = 1.57 W/kg
Maximum value of SAR (measured) = 2.90 W/kg



0 dB = 2.90 W/kg = 4.62 dBW/kg

Test Laboratory: CCIS Date/Time: 10.09.2019 16:15:00

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

Communication System: UID 0, GPRS(4 Slots) (0); Frequency: 1747.8 MHz; Duty Cycle: 1:1.99986
Medium parameters used (interpolated): f = 1747.8 MHz; σ = 1.357 S/m; ε_r = 40.762; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

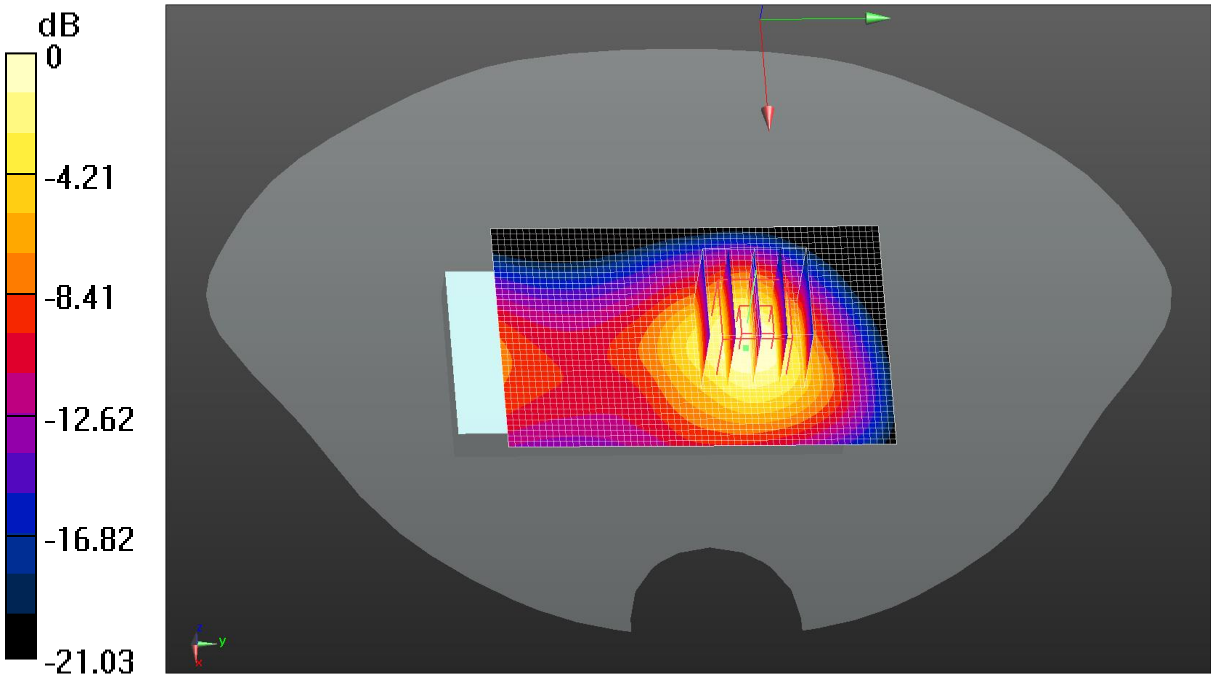
- Probe: EX3DV4 - SN3924; ConvF(8.4, 8.4, 8.4); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

GPRS 1800 4Slots Body Back/Middle Channel/Area Scan (41x61x1):

Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 4.20 W/kg

GPRS 1800 4Slots Body Back/Middle Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 34.67 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 4.92 W/kg
SAR(1 g) = 2.28 W/kg; SAR(10 g) = 1.2 W/kg
Maximum value of SAR (measured) = 3.70 W/kg



0 dB = 3.70 W/kg = 5.68 dBW/kg

Test Laboratory: CCIS　　　　Date/Time: 10.09.2019 17:23:22

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

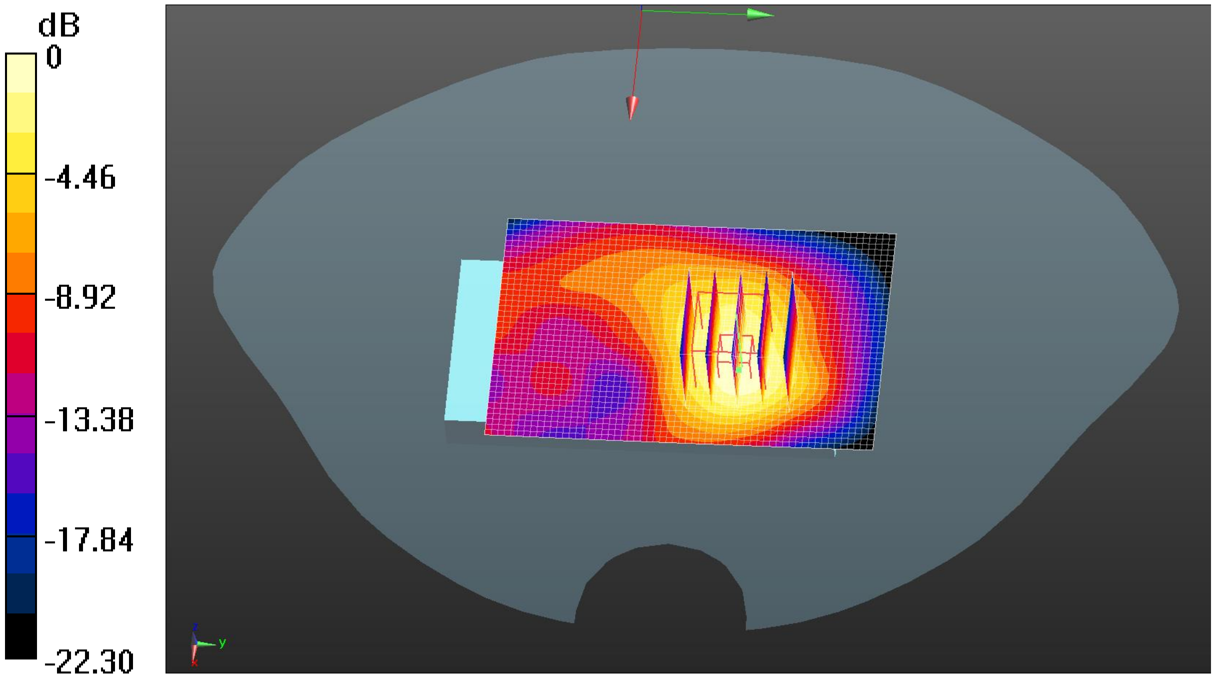
Communication System: UID 0, UMTS-FDD(WCDMA) (0); Frequency: 1950 MHz; Duty Cycle: 1:1
Medium parameters used: f = 1950 MHz; σ = 1.425 S/m; ε_r = 39.548; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(8.17, 8.17, 8.17); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

WCDMA 2100 Body Front/Middle Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.96 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 0.635 W/kg
SAR(1 g) = 0.356 W/kg; SAR(10 g) = 0.201 W/kg
Maximum value of SAR (measured) = 0.522 W/kg

WCDMA 2100 Body Front/Middle Channel/Area Scan (41x61x1): Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 0.619 W/kg



0 dB = 0.619 W/kg = -2.08 dBW/kg

Test Laboratory: CCIS Date/Time: 10.12.2019 14:27:18

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

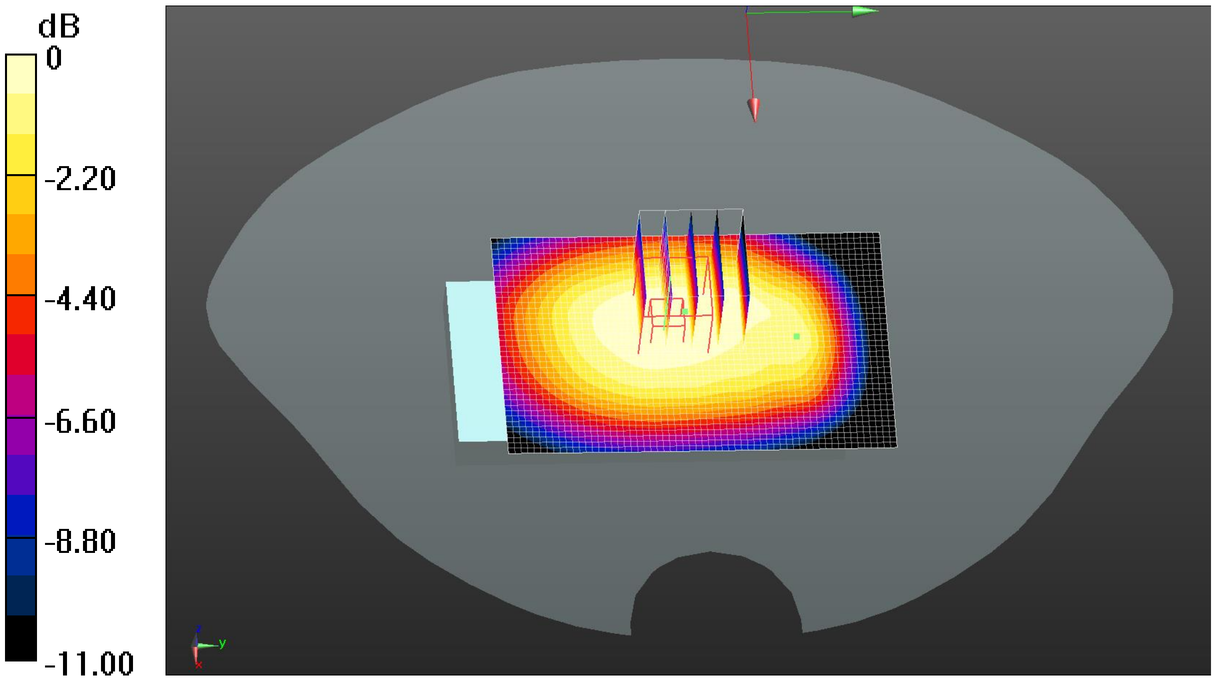
Communication System: UID 0, UMTS-FDD(WCDMA) (0); Frequency: 897.6 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 897.6 MHz; σ = 0.986 S/m; ε_r = 40.759; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(9.69, 9.69, 9.69); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

WCDMA 900 Body Back/Middle Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.16 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.17 W/kg
SAR(1 g) = 0.777 W/kg; SAR(10 g) = 0.552 W/kg
Maximum value of SAR (measured) = 1.02 W/kg

WCDMA 900 Body Back/Middle Channel/Area Scan (41x61x1): Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 0.990 W/kg



0 dB = 0.990 W/kg = -0.04 dBW/kg

Test Laboratory: CCIS Date/Time: 10.09.2019 21:11:16

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

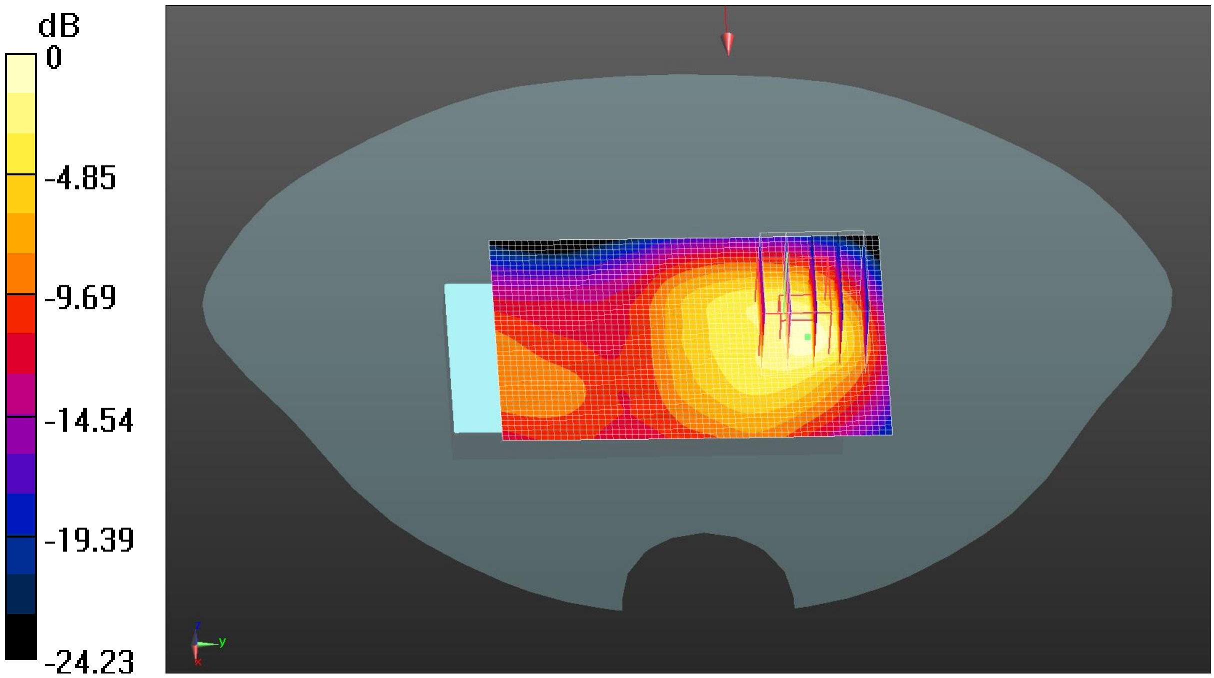
Communication System: UID 0, LTE-FDD(EU) (0); Frequency: 1950 MHz; Duty Cycle: 1:1
Medium parameters used: f = 1950 MHz; σ = 1.425 S/m; ε_r = 39.548; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(8.17, 8.17, 8.17); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

LTE Band 1 1RB(20MHz) Body Back/Middle Channel/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.39 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.21 W/kg
SAR(1 g) = 0.487 W/kg; SAR(10 g) = 0.219 W/kg
Maximum value of SAR (measured) = 0.860 W/kg

LTE Band 1 1RB(20MHz) Body Back/Middle Channel/Area Scan (41x61x1):
Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 0.762 W/kg



0 dB = 0.762 W/kg = -1.18 dBW/kg

Test Laboratory: CCIS Date/Time: 10.09.2019 22:16:46

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

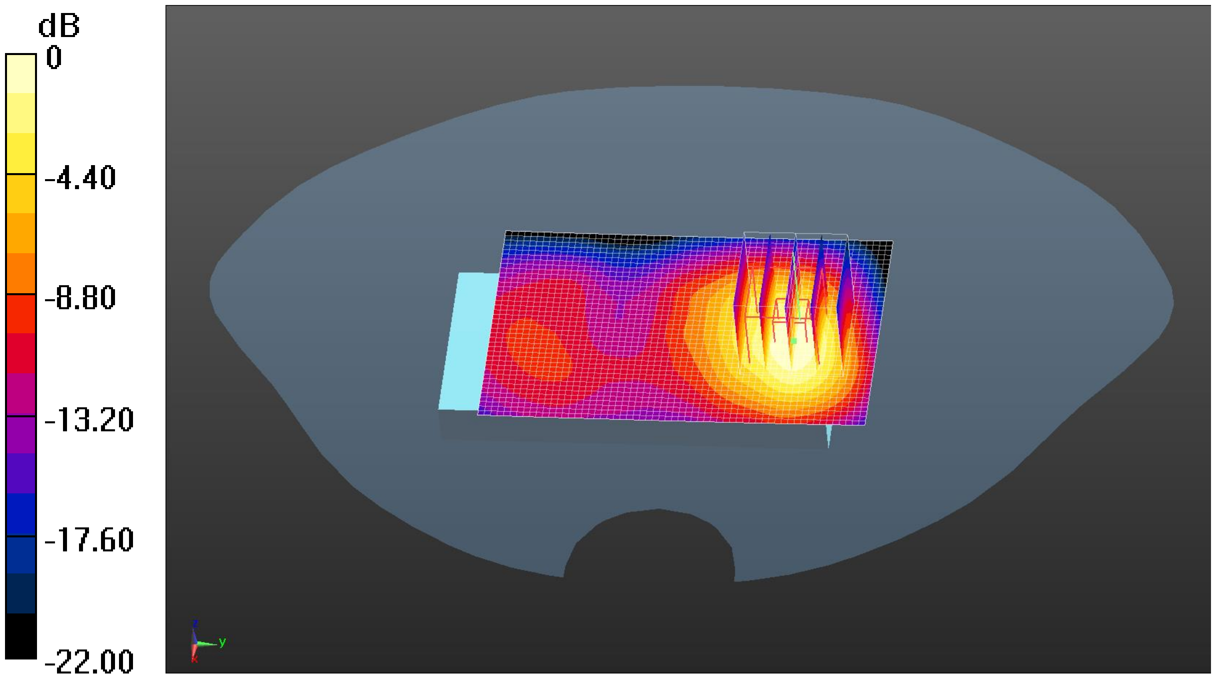
Communication System: UID 0, LTE-FDD(EU) (0); Frequency: 1747.5 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1747.5 MHz; σ = 1.357 S/m; ε_r = 40.762; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(8.4, 8.4, 8.4); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

LTE Band 3 1RB(20MHz) Body Back/Middle Channel/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.42 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 3.11 W/kg
SAR(1 g) = 1.36 W/kg; SAR(10 g) = 0.702 W/kg
Maximum value of SAR (measured) = 2.28 W/kg

LTE Band 3 1RB(20MHz) Body Back/Middle Channel/Area Scan (41x61x1):
Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 2.20 W/kg



0 dB = 2.20 W/kg = 3.42 dBW/kg

Test Laboratory: CCIS Date/Time: 10.21.2019 13:52:01

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

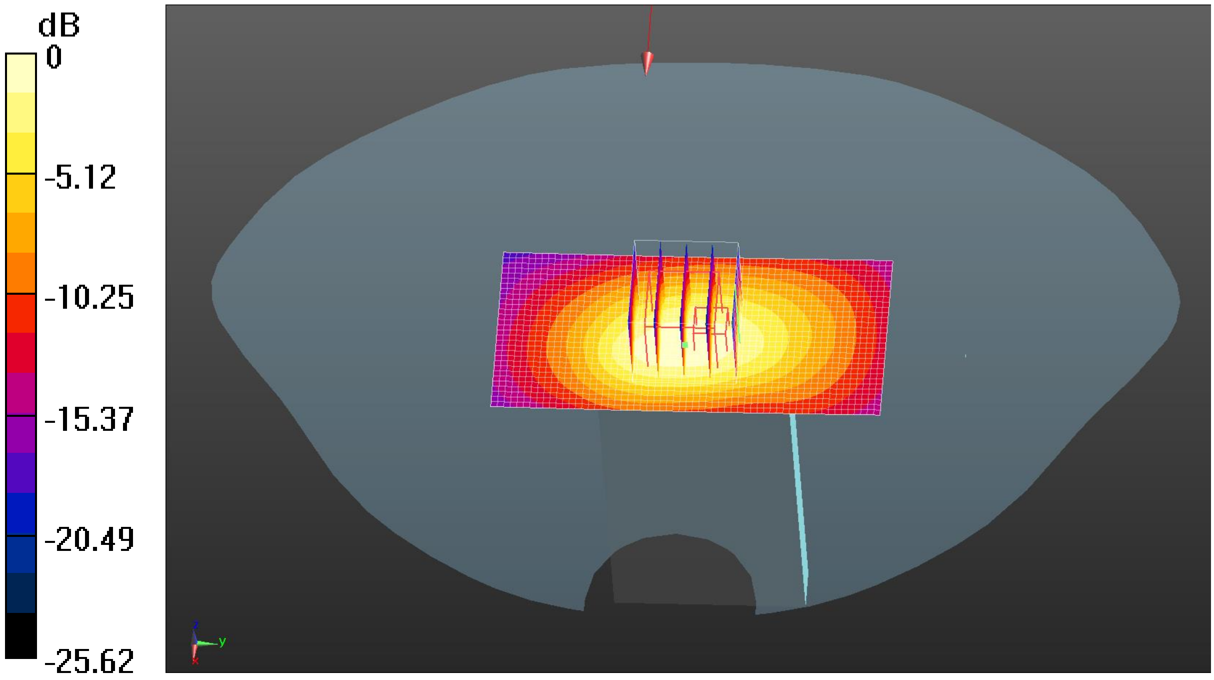
Communication System: UID 0, LTE-FDD(EU) (0); Frequency: 2535 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2535 MHz; σ = 1.943 S/m; ε_r = 38.926; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(7.54, 7.54, 7.54); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

LTE Band 7 1RB(20MHz) Body Bottom/Middle Channel/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.64 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.73 W/kg
SAR(1 g) = 0.677 W/kg; SAR(10 g) = 0.313 W/kg
Maximum value of SAR (measured) = 1.29 W/kg

LTE Band 7 1RB(20MHz) Body Bottom/Middle Channel/Area Scan (31x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.737 W/kg



0 dB = 0.737 W/kg = -1.33 dBW/kg

Test Laboratory: CCIS Date/Time: 10.12.2019 18:05:37

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

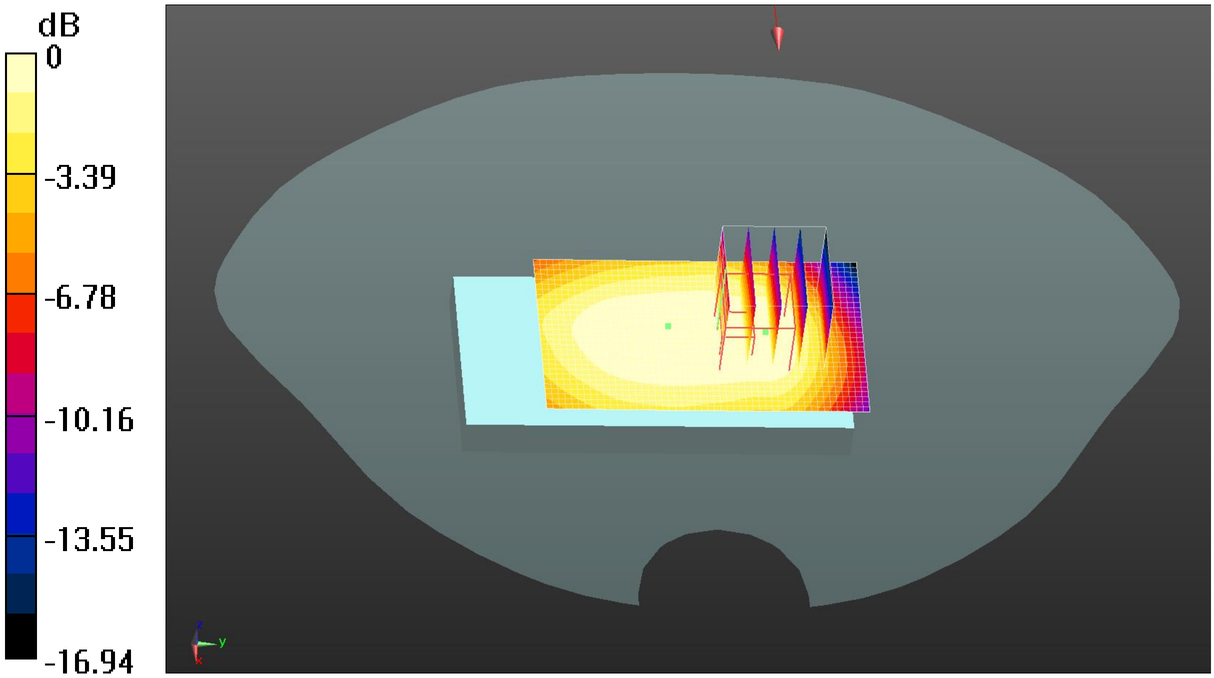
Communication System: UID 0, LTE-FDD(EU) (0); Frequency: 897.5 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 897.5 MHz; σ = 0.986 S/m; ε_r = 40.759; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(9.69, 9.69, 9.69); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

LTE Band 8 1RB(10MHz) Body Back/Middle Channel/Area Scan (31x51x1):
Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 1.09 W/kg

LTE Band 8 1RB(10MHz) Body Back/Middle Channel/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.89 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 1.11 W/kg
SAR(1 g) = 0.692 W/kg; SAR(10 g) = 0.430 W/kg
Maximum value of SAR (measured) = 0.964 W/kg



0 dB = 0.964 W/kg = -0.16 dBW/kg

Test Laboratory: CCIS Date/Time: 10.12.2019 19:14:39

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

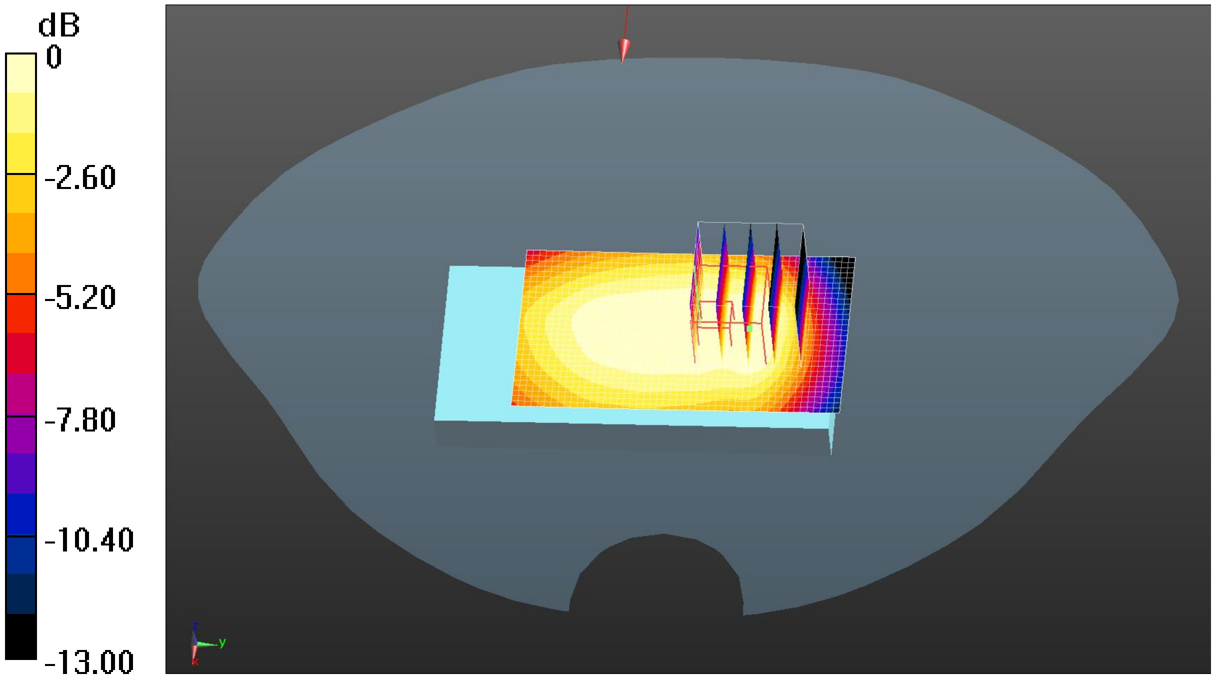
Communication System: UID 0, LTE-FDD(EU) (0); Frequency: 847 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 847 MHz; σ = 0.924 S/m; ε_r = 41.174; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(9.67, 9.67, 9.67); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

LTE Band 20 1RB(20MHz) Body Back/Middle Channel/Area Scan (31x51x1):
Interpolated grid: dx=2.000 mm, dy=2.000 mm
Maximum value of SAR (interpolated) = 0.932 W/kg

LTE Band 20 1RB(20MHz) Body Back/Middle Channel/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.62 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 0.920 W/kg
SAR(1 g) = 0.582 W/kg; SAR(10 g) = 0.370 W/kg
Maximum value of SAR (measured) = 0.805 W/kg



0 dB = 0.805 W/kg = -0.94 dBW/kg

Test Laboratory: CCIS   Date/Time: 10.21.2019 14:45:04

DUT: Smart Phone; Type: KINGKONG MINI; Serial: 1#

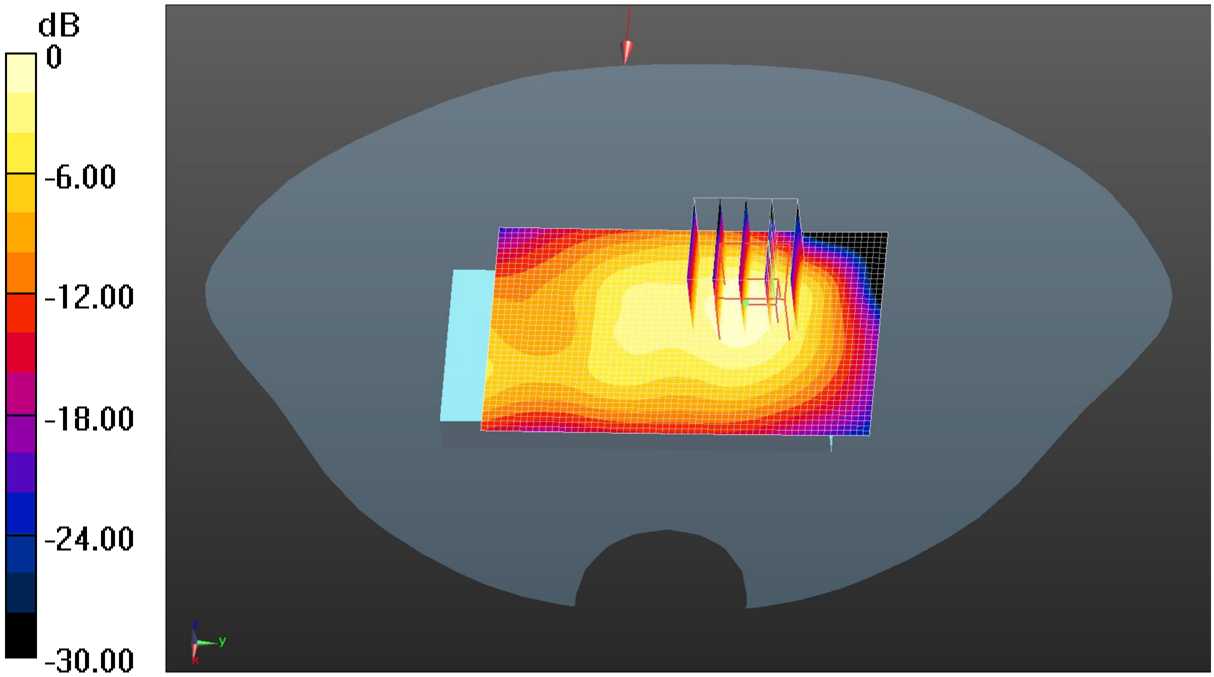
Communication System: UID 0, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps) (0);
Frequency: 2442 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2442 MHz; σ = 1.825 S/m; ε_r = 39.738; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3924; ConvF(7.54, 7.54, 7.54); Calibrated: 08.30.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1373; Calibrated: 08.09.2019
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

WIFI Body Back/Middle Channel/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.196 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.238 W/kg
SAR(1 g) = 0.107 W/kg; SAR(10 g) = 0.051 W/kg
Maximum value of SAR (measured) = 0.172 W/kg

WIFI Body Back/Middle Channel/Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.192 W/kg



0 dB = 0.192 W/kg = -7.17 dBW/kg

Appendix E: System Calibration Certificate

Calibration information for E-field probes

TTL In Collaboration with speag CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

ilac-MRA CNAS 中国认可 国际互认 校准 CALIBRATION CNAS L0570

Client CCIS Certificate No: Z19-60260

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3924
Calibration Procedure(s)	FF-Z11-004-01 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	August 30, 2019

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	18-Jun-19 (CTTL, No.J19X05125)	Jun-20
Power sensor NRP-Z91	101547	18-Jun-19 (CTTL, No.J19X05125)	Jun-20
Power sensor NRP-Z91	101548	18-Jun-19 (CTTL, No.J19X05125)	Jun-20
Reference10dBAttenuator	18N50W-10dB	09-Feb-18(CTTL, No.J18X01133)	Feb-20
Reference20dBAttenuator	18N50W-20dB	09-Feb-18(CTTL, No.J18X01132)	Feb-20
Reference Probe EX3DV4	SN 7307	24-May-19(SPEAG,No.EX3-7307_May19)	May-20
DAE4	SN 1331	06-Feb-19(SPEAG, No.DAE4-1331_Feb19)	Feb -20
DAE4	SN 917	07-Dec-18(SPEAG, No.DAE4-917_Dec18)	Dec -19
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	18-Jun-19 (CTTL, No.J19X05127)	Jun-20
Network Analyzer E5071C	MY46110673	24-Jan-19 (CTTL, No.J19X00547)	Jan -20

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: August 31, 2019

TTL In Collaboration with s p e a g CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i θ=0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016

c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2 -field uncertainty inside TSL (see below ConvF).
- *NORM(f)x,y,z = NORMx,y,z* frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- *Ax,y,z; Bx,y,z; Cx,y,z;VRx,y,z:*A,B,C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from±50MHz to±100MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

Probe EX3DV4

SN: 3924

Calibrated: August 30, 2019

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

TTL In Collaboration with s p e a g CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3924

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm($\mu V/(V/m)^2$)[A]	0.50	0.42	0.67	±10.0%
DCP(mV)[B]	101.3	100.5	100.2	

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	181.3	±2.3%
		Y	0.0	0.0	1.0		161.5	
		Z	0.0	0.0	1.0		206.8	

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

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3924

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	41.9	0.89	10.07	10.07	10.07	0.40	0.80	±12.1%
835	41.5	0.90	9.67	9.67	9.67	0.16	1.34	±12.1%
900	41.5	0.97	9.69	9.69	9.69	0.20	1.20	±12.1%
1750	40.1	1.37	8.40	8.40	8.40	0.22	1.07	±12.1%
1900	40.0	1.40	8.17	8.17	8.17	0.28	0.97	±12.1%
2300	39.5	1.67	7.85	7.85	7.85	0.46	0.76	±12.1%
2450	39.2	1.80	7.54	7.54	7.54	0.51	0.75	±12.1%
2600	39.0	1.96	7.30	7.30	7.30	0.60	0.69	±12.1%
5250	35.9	4.71	5.48	5.48	5.48	0.40	1.40	±13.3%
5600	35.5	5.07	4.86	4.86	4.86	0.40	1.40	±13.3%
5750	35.4	5.22	4.98	4.98	4.98	0.45	1.40	±13.3%

[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequency 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 the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

TTL In Collaboration with speag CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3924

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)	Unct. (k=2)
750	55.5	0.96	10.07	10.07	10.07	0.17	1.40	±12.1%
835	55.2	0.97	9.72	9.72	9.72	0.19	1.34	±12.1%
900	55.0	1.05	9.75	9.75	9.75	0.24	1.14	±12.1%
1750	53.4	1.49	8.12	8.12	8.12	0.23	1.06	±12.1%
1900	53.3	1.52	7.83	7.83	7.83	0.23	1.08	±12.1%
2300	52.9	1.81	7.66	7.66	7.66	0.49	0.88	±12.1%
2450	52.7	1.95	7.51	7.51	7.51	0.56	0.80	±12.1%
2600	52.5	2.16	7.26	7.26	7.26	0.64	0.71	±12.1%
5250	48.9	5.36	4.90	4.90	4.90	0.40	1.70	±13.3%
5600	48.5	5.77	4.28	4.28	4.28	0.50	1.30	±13.3%
5750	48.3	5.94	4.32	4.32	4.32	0.55	1.50	±13.3%

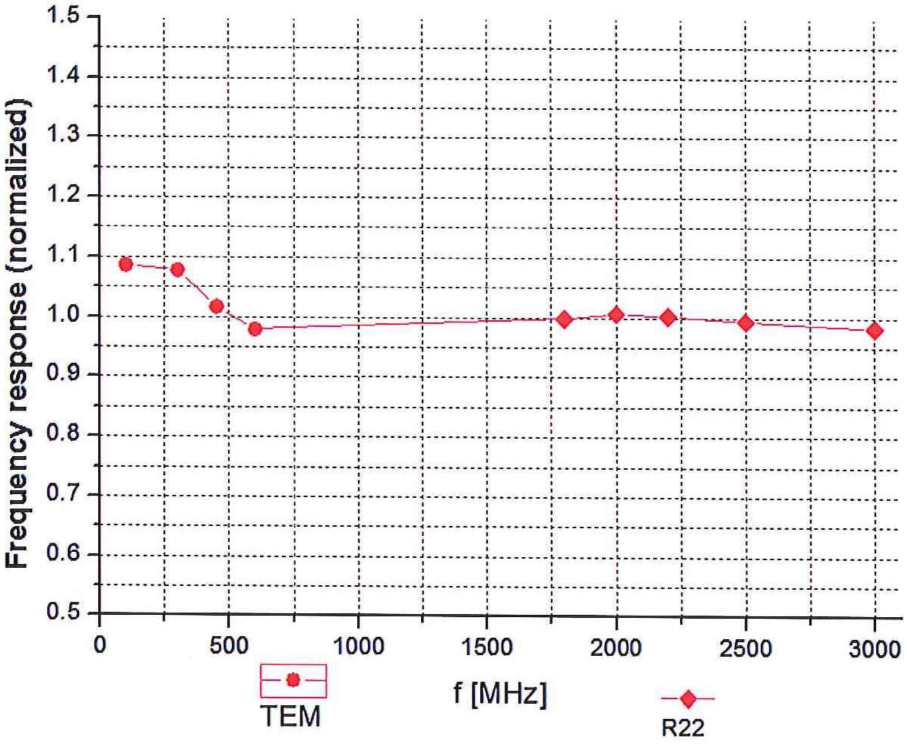
[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequency 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 the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

TTL In Collaboration with speag CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

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



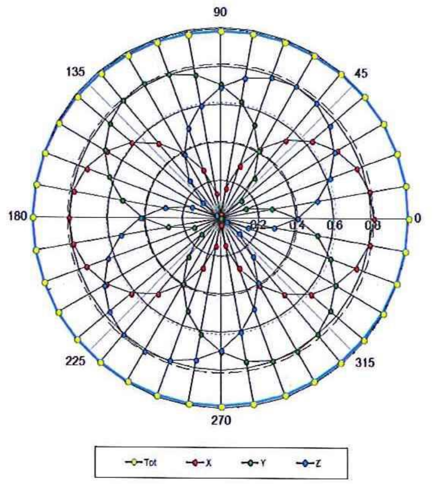
Uncertainty of Frequency Response of E-field: ±7.4% (k=2)

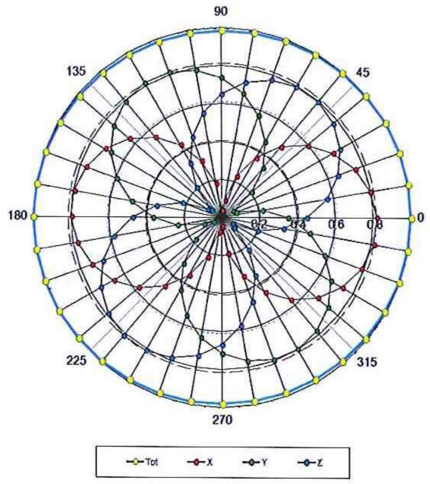
In Collaboration with
speag
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

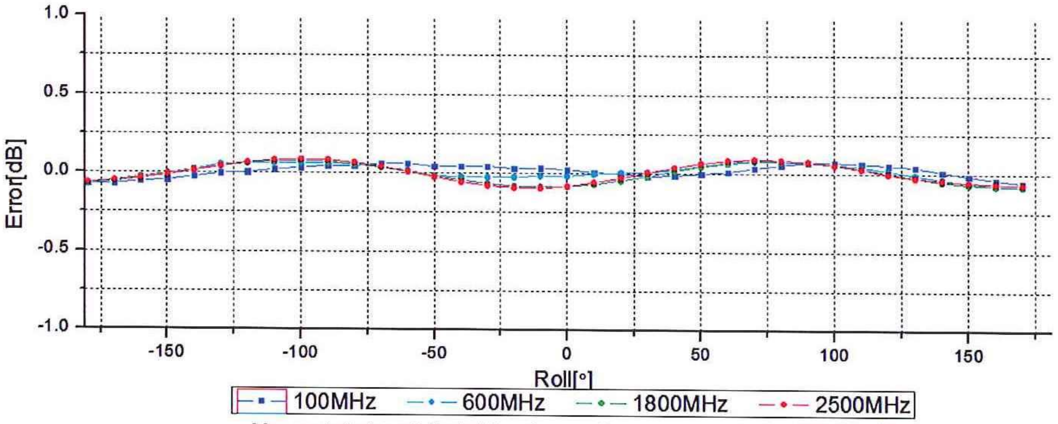
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM

f=1800 MHz, R22

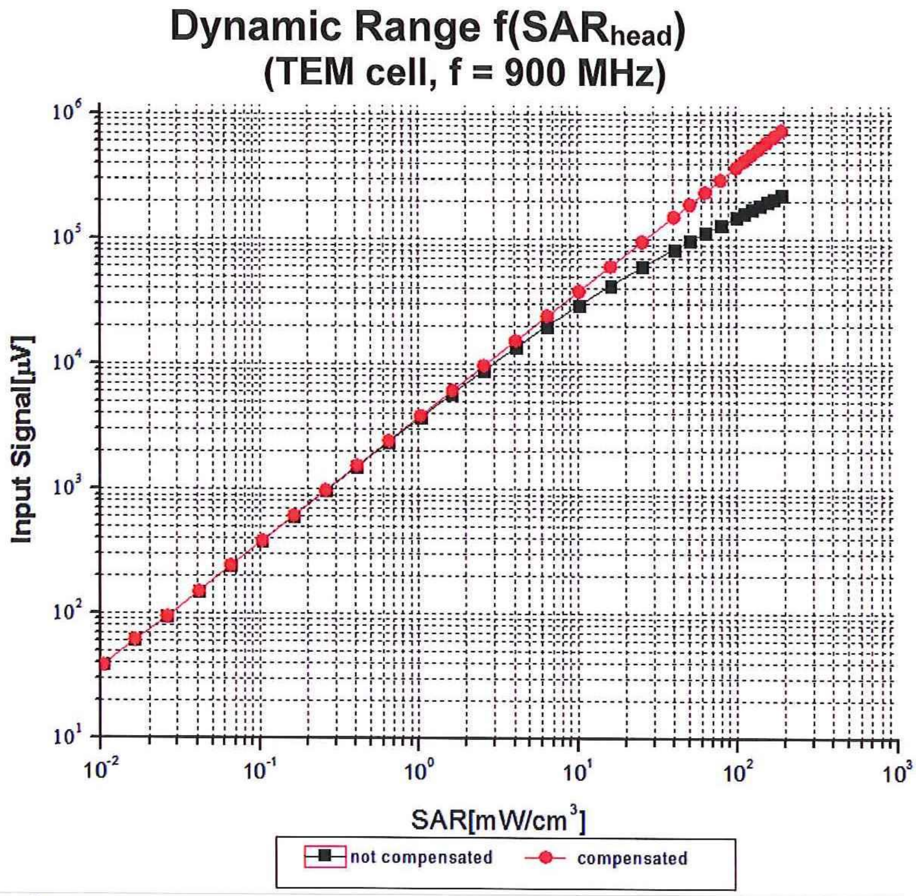


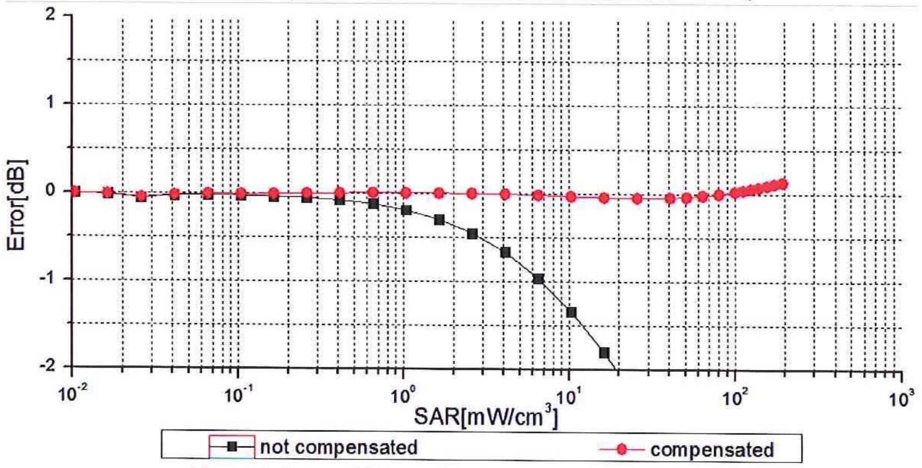




Uncertainty of Axial Isotropy Assessment: ±1.2% (k=2)

TTL In Collaboration with speag CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

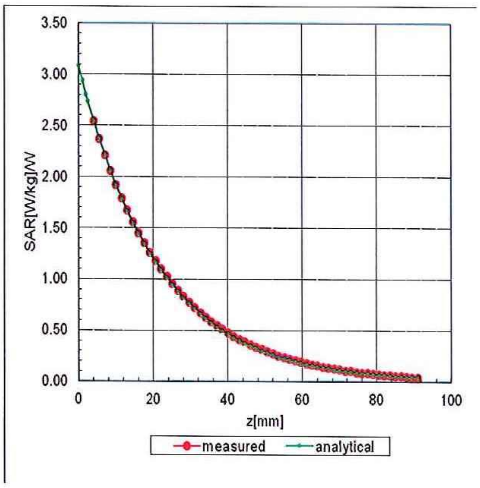


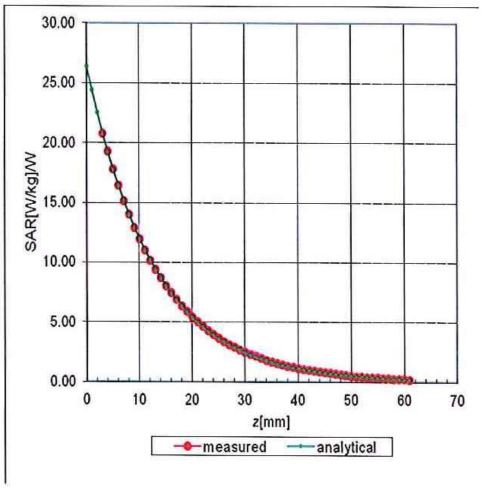


Uncertainty of Linearity Assessment: ±0.9% (k=2)

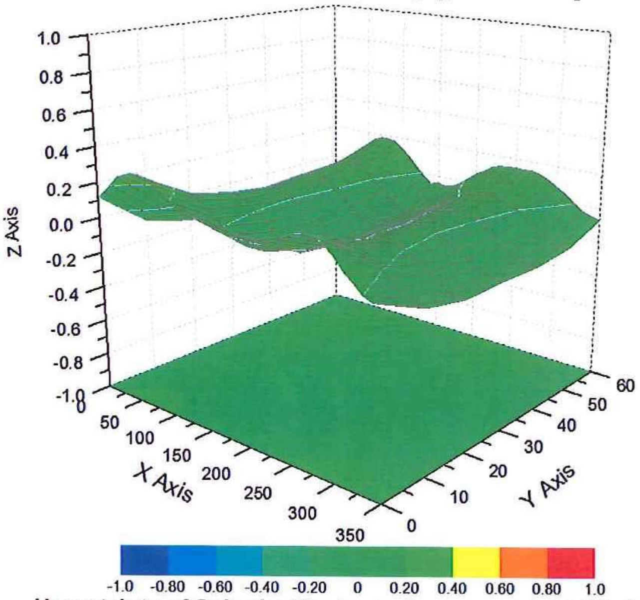
TTL In Collaboration with speag CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

Conversion Factor Assessment





Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±3.2% (K=2)

TTL In Collaboration with speag CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3924

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	159.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

Calibration information for Dipole

TTL In Collaboration with speag CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

ilac-MRA CNAS 中国认可 国际互认 校准 CALIBRATION CNAS L0570

Client CCIS Certificate No: Z19-60175

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d154
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	June 11, 2019

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Power sensor NRP8S	104291	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Reference Probe EX3DV4	SN 7514	27-Aug-18(SPEAG,No.EX3-7514_Aug18)	Aug-19
DAE4	SN 1556	20-Aug-18(SPEAG,No.DAE4-1556_Aug18)	Aug-19
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	23-Jan-19 (CTTL, No.J19X00336)	Jan-20
NetworkAnalyzer E5071C	MY46110673	24-Jan-19 (CTTL, No.J19X00547)	Jan-20

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: June 14, 2019

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

In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016

c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010

d) KDB865664, 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%.

TTL In Collaboration with s p e a g CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	52.10.2.1504
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
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	41.1 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.49 W/kg ± 18.8 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.57 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.33 W/kg ± 18.7 % (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	55.0 ± 6 %	0.97 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °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	**9.57 W /kg ± 18.8 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.58 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.31 W/kg ± 18.7 % (k=2)**

TTL In Collaboration with s p e a g CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.9Ω- 3.09jΩ
Return Loss	- 29.0dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.3Ω- 4.87jΩ
Return Loss	- 24.9dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.277 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

CTTL In Collaboration with s p e a g CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL Date: 06.11.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d154

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

Medium parameters used: f = 835 MHz; σ = 0.886 S/m; ε_r = 41.12; ρ = 1000 kg/m3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(9.09, 9.09, 9.09) @ 835 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 8/20/2018
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

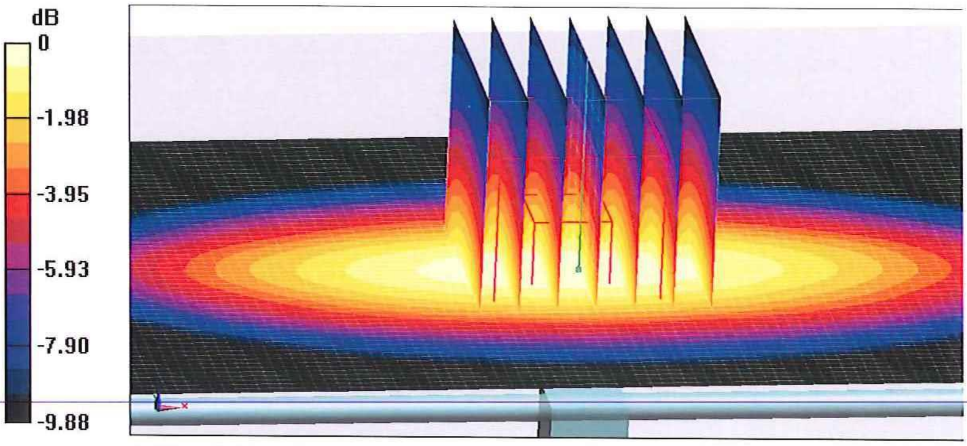
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 58.27 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.45 W/kg

SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.57 W/kg

Maximum value of SAR (measured) = 3.09 W/kg

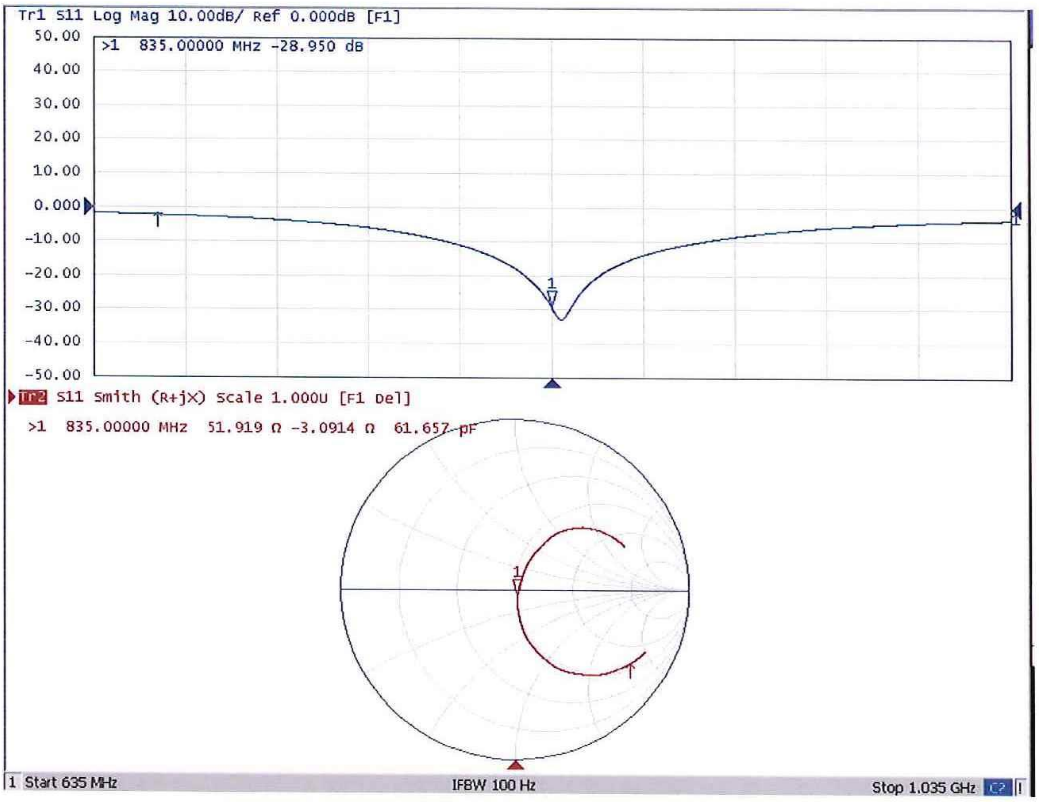


0 dB = 3.09 W/kg = 4.90 dBW/kg

In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL



In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Body TSL Date: 06.11.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d154

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

Medium parameters used: f = 835 MHz; σ = 0.973 S/m; ε_r = 55; ρ = 1000 kg/m3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(9.47, 9.47, 9.47) @ 835 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 8/20/2018
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

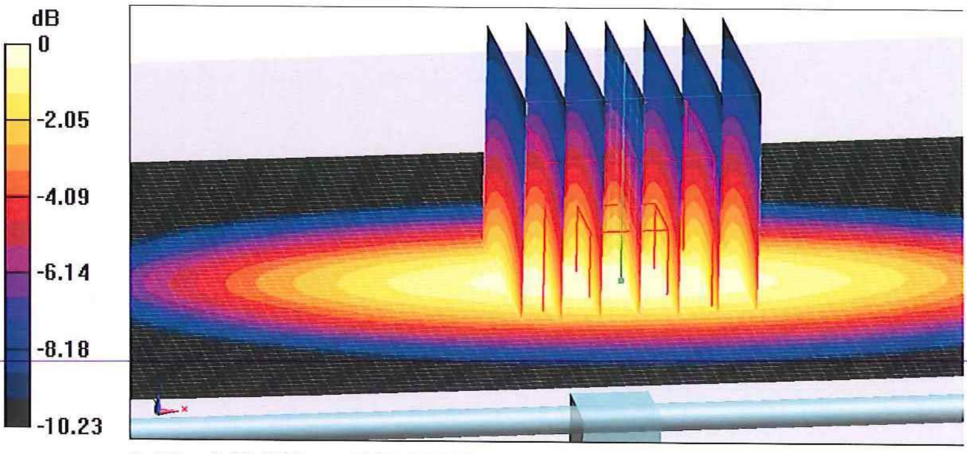
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.93 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.67 W/kg

SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.58 W/kg

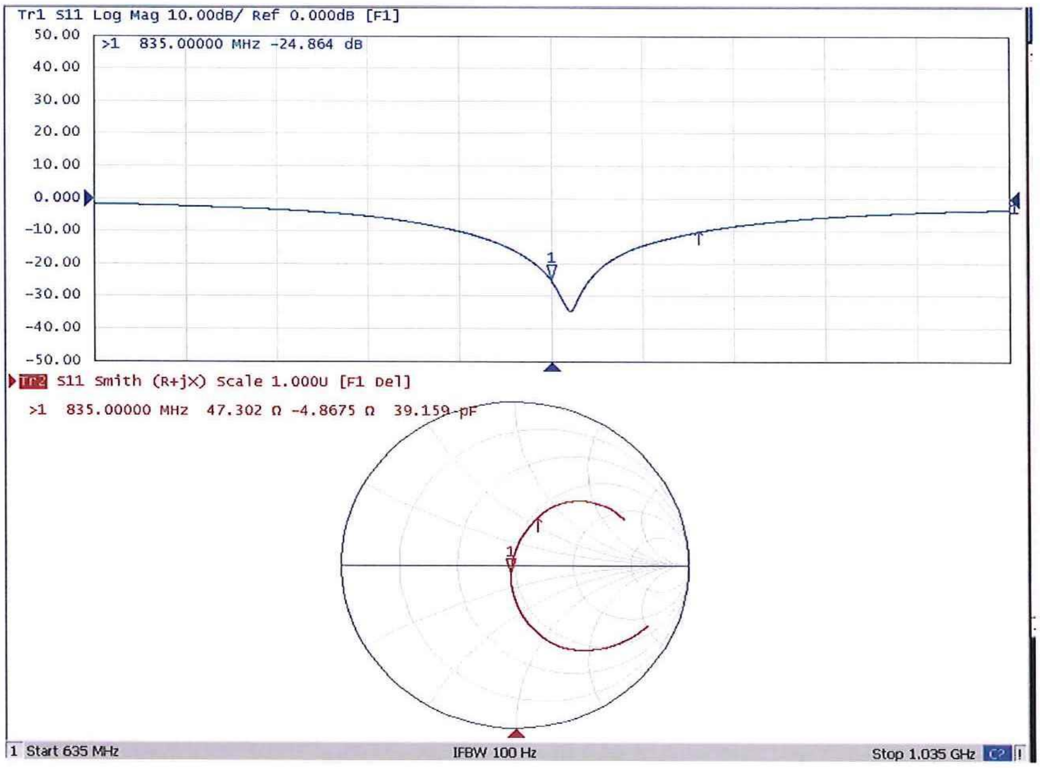
Maximum value of SAR (measured) = 3.23 W/kg



0 dB = 3.23 W/kg = 5.09 dBW/kg

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Body TSL



In Collaboration with speag CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Client CCIS Certificate No: Z19-60177

CALIBRATION CERTIFICATE

Object: D2450V2 - SN: 910

Calibration Procedure(s): FF-Z11-003-01
Calibration Procedures for dipole validation kits

Calibration date: June 10, 2019

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Power sensor NRP8S	104291	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Reference Probe EX3DV4	SN 7514	27-Aug-18(SPEAG,No.EX3-7514_Aug18)	Aug-19
DAE4	SN 1556	20-Aug-18(SPEAG,No.DAE4-1556_Aug18)	Aug-19
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	23-Jan-19 (CTTL, No.J19X00336)	Jan-20
NetworkAnalyzer E5071C	MY46110673	24-Jan-19 (CTTL, No.J19X00547)	Jan-20

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: June 14, 2019

TTL In Collaboration with s p e a g CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, 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%.

In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	52.10.2.1495
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.8 ± 6 %	1.83 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.6 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.11 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.4 W/kg ± 18.7 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.1 ± 6 %	1.96 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.8 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.9 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.94 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.7 W/kg ± 18.7 % (k=2)**

TTL In Collaboration with s p e a g CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.1Ω+ 2.51 jΩ
Return Loss	- 26.8dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	52.3Ω+ 3.40 jΩ
Return Loss	- 27.9dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.020 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

In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL Date: 06.10.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 910

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; σ = 1.825 S/m; ε_r = 39.75; ρ = 1000 kg/m3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(6.95, 6.95, 6.95) @ 2450 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 8/20/2018
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

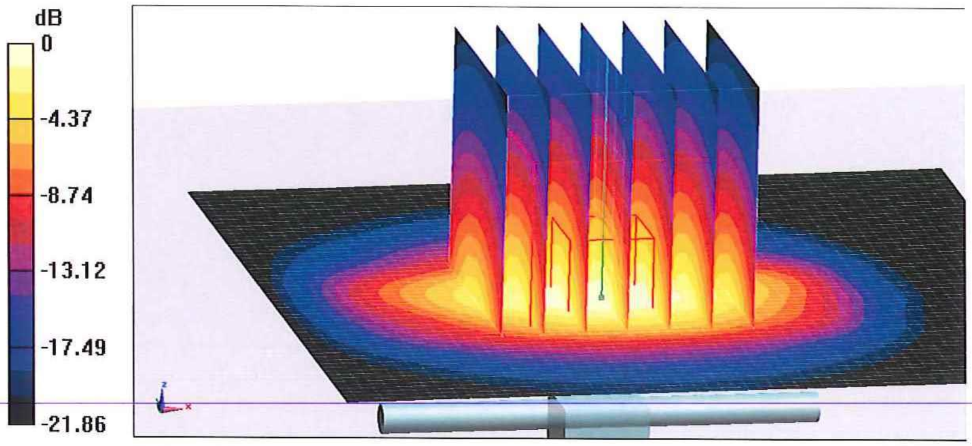
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.66 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 27.4 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.11 W/kg

Maximum value of SAR (measured) = 22.3 W/kg



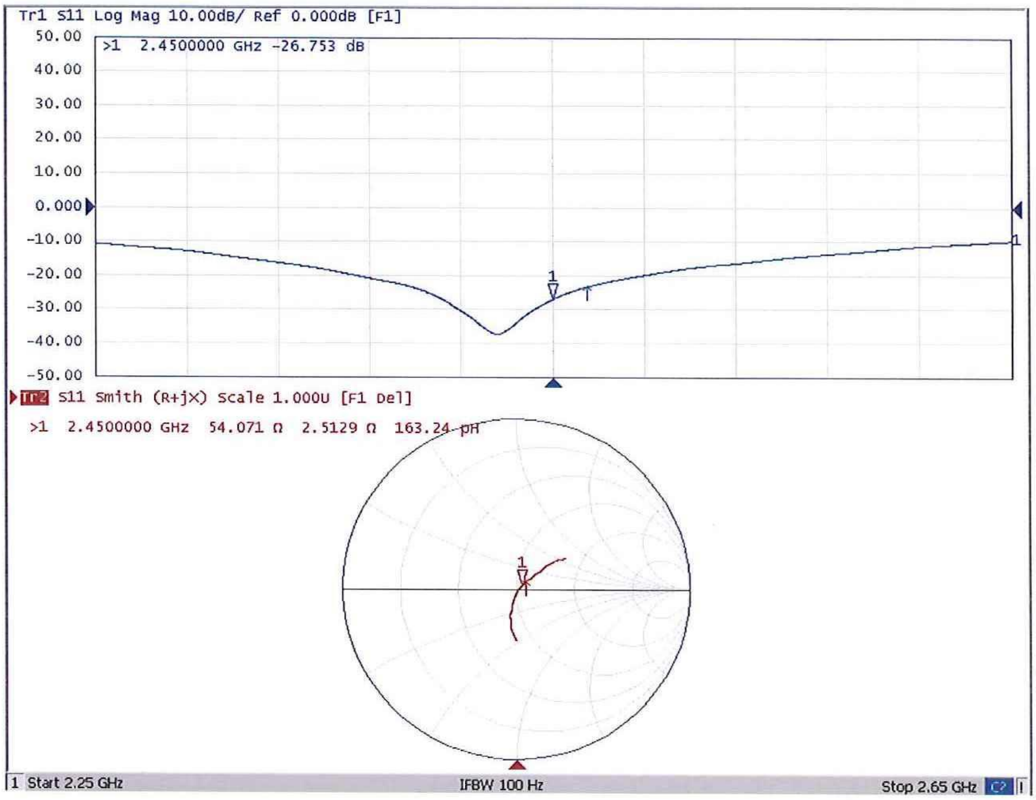
0 dB = 22.3 W/kg = 13.48 dBW/kg

TTL

In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL



In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Body TSL Date: 06.10.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 910

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; σ = 1.962 S/m; ε_r = 52.06; ρ = 1000 kg/m3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(7.13, 7.13, 7.13) @ 2450 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 8/20/2018
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

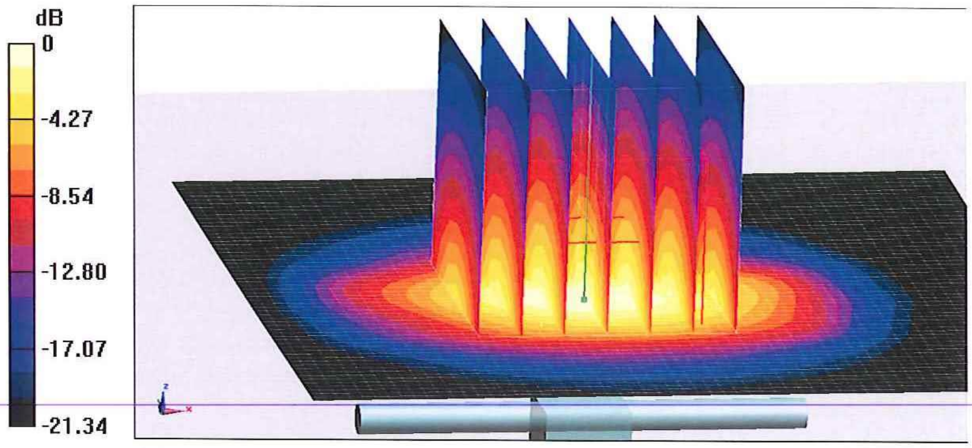
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 89.63 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 26.4 W/kg

SAR(1 g) = 12.8 W/kg; SAR(10 g) = 5.94 W/kg

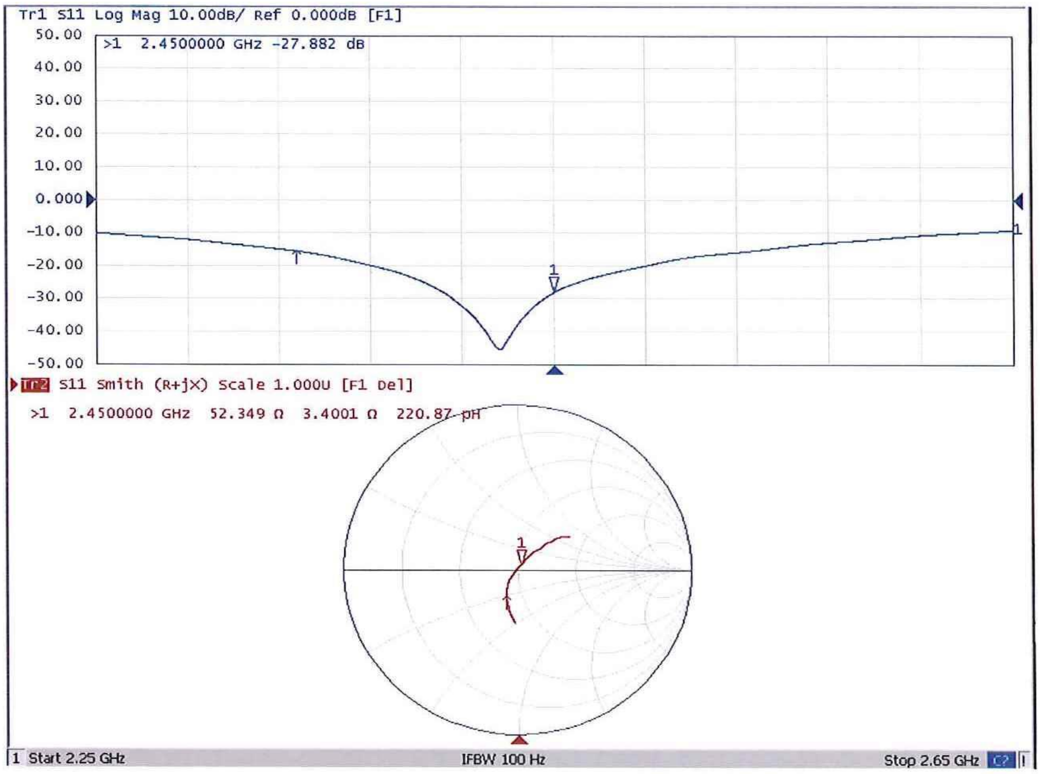
Maximum value of SAR (measured) = 21.3 W/kg



0 dB = 21.3 W/kg = 13.28 dBW/kg

TTL In Collaboration with s p e a g CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Body TSL



TTL In Collaboration with s p e a g CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

ilac-MRA CNAS 中国认可 国际互认 校准 CALIBRATION CNAS L0570

Client CCIS Certificate No: Z18-60466

CALIBRATION CERTIFICATE

Object	D2600V2 - SN: 1114
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	November 5, 2018

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102196	07-Mar-18 (CTTL, No.J18X01510)	Mar-19
Power sensor NRV-Z5	100596	07-Mar-18 (CTTL, No.J18X01510)	Mar-19
Reference Probe EX3DV4	SN 7514	27-Aug-18(SPEAG,No.EX3-7514_Aug18)	Aug-19
DAE4	SN 1555	20-Aug-18(SPEAG,No.DAE4-1555_Aug18)	Aug-19
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	23-Jan-18 (CTTL, No.J18X00560)	Jan-19
Network Analyzer E5071C	MY46110673	24-Jan-18 (CTTL, No.J18X00561)	Jan-19

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: November 7, 2018

TTL
In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016

c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010

d) KDB865664, 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%.

TTL In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	52.10.2.1495
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.4 ± 6 %	1.94 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**56.3 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.24 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**25.1 mW /g ± 18.7 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.7 ± 6 %	2.21 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.4 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**53.1 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.92 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**23.6 mW /g ± 18.7 % (k=2)**

CTTL In Collaboration with speag CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL Date: 11.05.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1114

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2600 MHz; $\sigma = 1.944$ S/m; $\varepsilon_r = 39.41$; $\rho = 1000$ kg/m3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(6.92, 6.92, 6.92) @ 2600 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

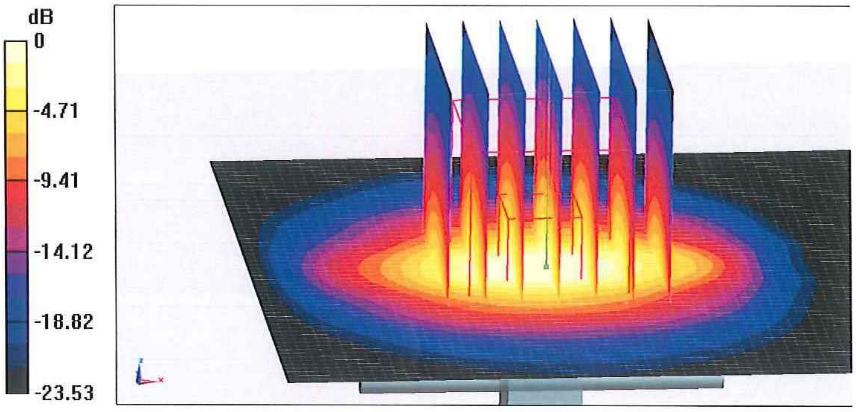
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 107.5 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 30.7 W/kg

SAR(1 g) = 14 W/kg; SAR(10 g) = 6.24 W/kg

Maximum value of SAR (measured) = 24.3 W/kg

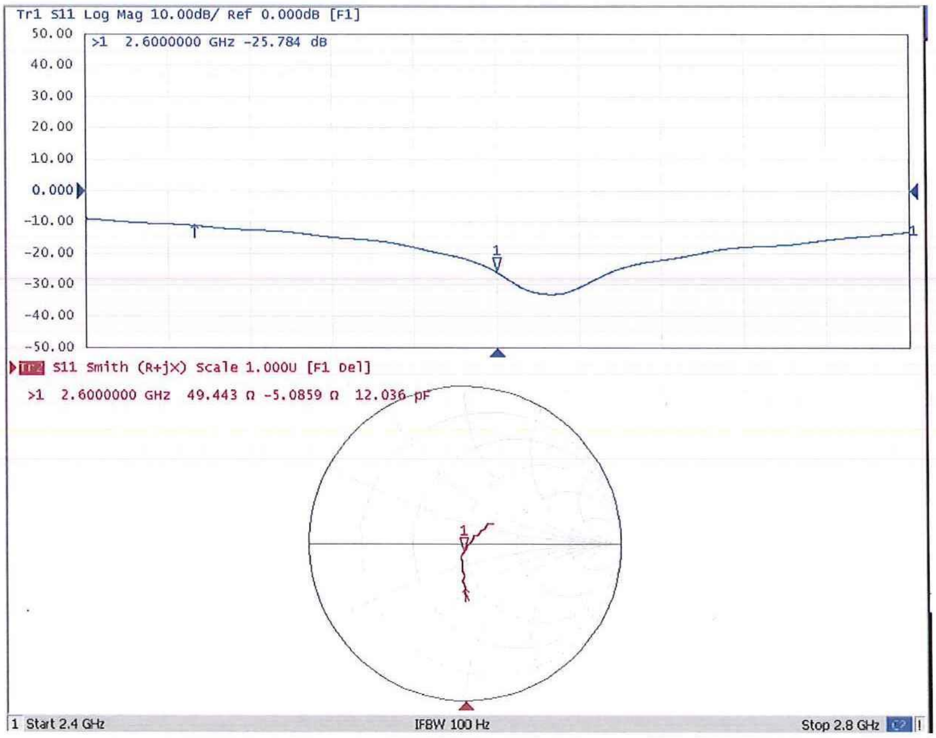


0 dB = 24.3 W/kg = 13.86 dBW/kg

In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL



In Collaboration with
speag
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Body TSL Date: 11.01.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1114

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2600 MHz; σ = 2.206 S/m; ε_r = 52.65; ρ = 1000 kg/m3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(7.06, 7.06, 7.06) @ 2600 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

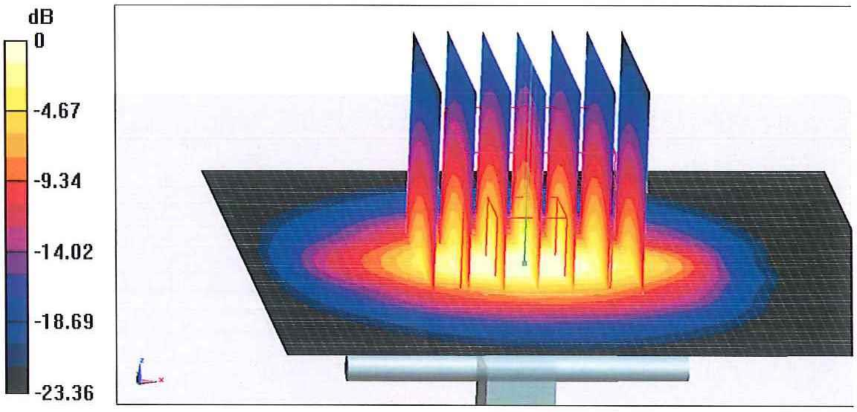
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.22 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 29.3 W/kg

SAR(1 g) = 13.4 W/kg; SAR(10 g) = 5.92 W/kg

Maximum value of SAR (measured) = 23.0 W/kg



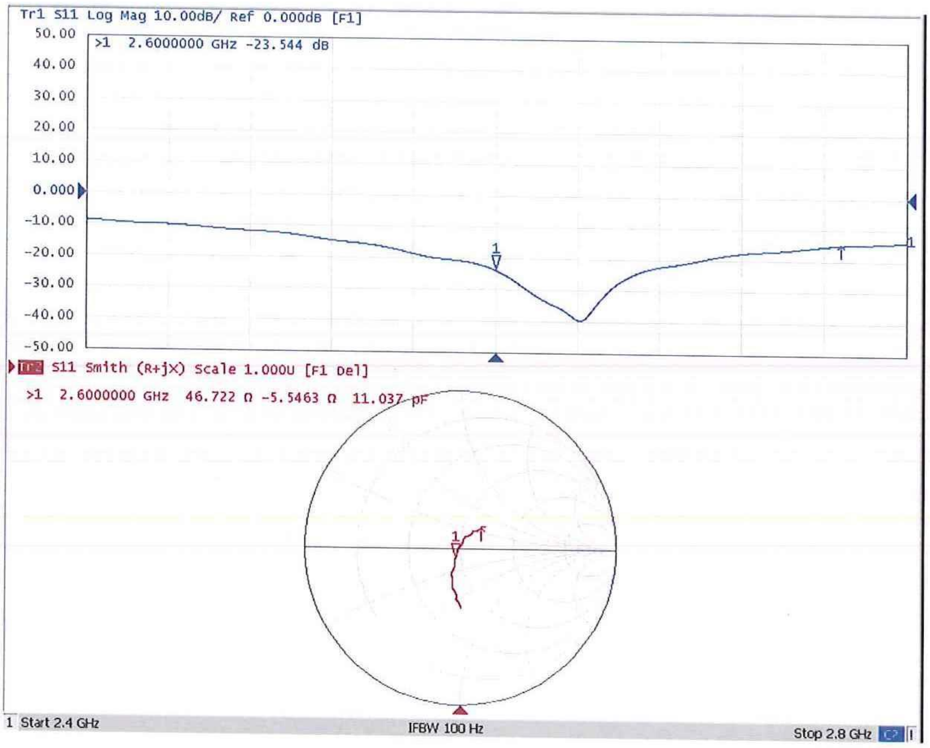
0 dB = 23.0 W/kg = 13.62 dBW/kg

Certificate No: Z18-60466 Page 7 of 8

In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Body TSL



Calibration information for DAE

Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
www.speag.swiss, info@speag.swiss

1373

IMPORTANT NOTICE

USAGE OF THE DAE4

The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:

Battery Exchange: The battery cover of the DAE4 unit is fixed using a screw, over tightening the screw may cause the threads inside the DAE to wear out.

Shipping of the DAE: Before shipping the DAE to SPEAG for calibration, remove the batteries and pack the DAE in an antistatic bag. This antistatic bag shall then be packed into a larger box or container which protects the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.

E-Stop Failures: Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, the customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.

Repair: Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect.

DASY Configuration Files: Since the exact values of the DAE input resistances, as measured during the calibration procedure of a DAE unit, are not used by the DASY software, a nominal value of 200 MOhm is given in the corresponding configuration file.

Important Note:
Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.

Important Note:
Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.

Important Note:
To prevent damage of the DAE probe connector pins, use great care when installing the probe to the DAE. Carefully connect the probe with the connector notch oriented in the mating position. Avoid any rotational movement of the probe body versus the DAE while turning the locking nut of the connector. The same care shall be used when disconnecting the probe from the DAE.

TN_EH190306AE DAE4.docx 07.03.2019

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 **CCIS-SZ**

Certificate No: **DAE4-1373_Aug19**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BM - SN: 1373
Calibration procedure(s)	QA CAL-06.v29 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	August 09, 2019

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	03-Sep-18 (No:23488)	Sep-19
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	07-Jan-19 (in house check)	In house check: Jan-20
Calibrator Box V2.1	SE UMS 006 AA 1002	07-Jan-19 (in house check)	In house check: Jan-20

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Laboratory Technician	
Approved by:	Sven Kühn	Deputy Manager	i.V.

Issued: August 9, 2019

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

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

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

Accreditation No.: **SCS 0108**

Glossary

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

Methods Applied and Interpretation of Parameters

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

DC Voltage Measurement

A/D - Converter Resolution nominal

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

Low Range: 1LSB = 61nV , full range = -1.......+3mV

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

Calibration Factors	X	Y	Z
High Range	403.900 ± 0.02% (k=2)	403.865 ± 0.02% (k=2)	404.160 ± 0.02% (k=2)
Low Range	3.98780 ± 1.50% (k=2)	4.00905 ± 1.50% (k=2)	4.01338 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	345.5 ° ± 1 °

Shenzhen ZhongjianNanfang Testing Co., Ltd. Project No.: CCISE1909095
No.B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,
Bao'an District, Shenzhen, Guangdong,China
Telephone: +86 (0) 755 23118282 Fax: +86 (0) 755 23116366, E-mail:info@ccis-cb.com

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	200036.64	-1.49	-0.00
Channel X	+ Input	20007.66	1.67	0.01
Channel X	- Input	-20003.26	2.58	-0.01
Channel Y	+ Input	200034.92	-3.47	-0.00
Channel Y	+ Input	20005.00	-0.97	-0.00
Channel Y	- Input	-20006.45	-0.51	0.00
Channel Z	+ Input	200037.03	-1.49	-0.00
Channel Z	+ Input	20004.07	-1.80	-0.01
Channel Z	- Input	-20007.76	-1.72	0.01

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2001.79	0.32	0.02
Channel X	+ Input	201.61	0.11	0.05
Channel X	- Input	-198.39	0.12	-0.06
Channel Y	+ Input	2001.55	0.19	0.01
Channel Y	+ Input	200.46	-0.94	-0.47
Channel Y	- Input	-199.08	-0.47	0.24
Channel Z	+ Input	2001.56	0.26	0.01
Channel Z	+ Input	199.82	-1.52	-0.76
Channel Z	- Input	-200.52	-1.83	0.92

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	8.18	6.30
	- 200	-5.94	-7.46
Channel Y	200	10.49	10.28
	- 200	-12.77	-12.84
Channel Z	200	6.36	6.21
	- 200	-9.67	-10.13

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	0.96	-5.39
Channel Y	200	8.75	-	1.70
Channel Z	200	9.62	5.88	-

Shenzhen ZhongjianNanfang Testing Co., Ltd. Project No.: CCISE1909095
No.B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,
Bao'an District, Shenzhen, Guangdong,China
Telephone: +86 (0) 755 23118282 Fax: +86 (0) 755 23116366, E-mail:info@ccis-cb.com

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	15936	15515
Channel Y	15863	15901
Channel Z	15893	17897

5. Input Offset Measurement

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

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	1.11	0.38	2.16	0.31
Channel Y	0.40	-0.61	1.25	0.33
Channel Z	-1.61	-2.89	-0.27	0.46

6. Input Offset Current

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

7. Input Resistance (Typical values for information)

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

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

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

9. Power Consumption (Typical values for information)

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

------End of report------

Shenzhen ZhongjianNanfang Testing Co., Ltd.
No.B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,
Bao’an District, Shenzhen, Guangdong,China
Telephone: +86 (0) 755 23118282 Fax: +86 (0) 755 23116366, E-mail:info@ccis-cb.com