FCC SAR TEST REPORT

For

SENWA MEXICO,S.A.DE C.V

Av. Javier Barros Sierra 540,Torre I, Planta 5; COL. LOMAS DE SANTA

FE DELEGACION ALVARO OBREGON C.P. 01210

MEXICO,DISTRITO FEDERAL

Product Name	: Smart Phone
Model No.	: S915
FCC ID	: 2AAA6-S915
Date of Receipt	: 28th May. 2015
Date of Test	: 1st ~13rd Jun. 2015
Issued Date	: 16th Jun. 2015
Report No.	: TS201505058
Report Version	: V1.0

Issue By

Shenzhen Sunway Communication CO.,LTD Testing Center

1/F,BuildingA，SDG Info Port, KefengRoad，Hi-Tech Park, Nanshan District, Shenzhen , Guangdong, China 518104,

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1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing are as follows.

<Highest SAR Summary>

Exposure Position	Frequency Band	1g-SAR (W/kg)	Highest 1g-SAR (W/kg)
Head	GSM850	0.298	**0.405**
	GSM1900	0.278	
	WCDMA V	0.261	
	WCDMA II	0.373	
	WLAN 2.4GHz Band	**0.405**	
Body (1cm Gap)	GSM850	0.644	**1.05**
	GSM1900	0.732	
	WCDMA V	0.310	
	WCDMA II	**1.05**	
	WLAN 2.4GHz Band	0.214	

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2003.

<Highest simultaneous transmission SAR>

	Position	Main antenna	WLAN 2.4G	Bluetooth	Max Sum
Highest SAR value for Head	Right Cheek	0.371	0.405	0.067	**0.776**
Highest SAR value for Body	Bottom Side	1.05	/	0.033	**1.08**

According to the above table, the maximum sum of reported SAR values for GSM/WCDMA and BT/WIFI is 1.08W/kg (1g).

2. SAR Evaluation compliance

Product Name:	Smart Phone
Brand Name:	SENWA
Model Name:	S915
Applicant:	SENWA MEXICO,S.A.DE C.V
Address:	Av. Javier Barros Sierra 540,Torre I, Planta 5; COL. LOMAS DE SANTA FE DELEGACION ALVARO OBREGON C.P. 01210 MEXICO,DISTRITO FEDERAL
Manufacturer:	MEGAUN GROUP
Address:	Room 315,HKUST SZ IER Building, No, 9 Yuexing 1stRD,South Area, Hi-tech Park, Nanshan, Shenzhen,P.R.C
Applicable Standard:	FCC 47 CFR Part 2 (2.1093) ANSI/IEEE C95.1-1992 IEEE 1528-2003 FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03 FCC KDB 865664 D02 SAR Reporting v01r01 FCC KDB 447498 D01 General RF Exposure Guidance v05r02 FCC KDB 941225 D06 Hotspot Mode SAR v01r01 FCC KDB 648474 D04 SAR Evaluation Considerations for Wireless Handsets v01r02 FCC KDB 248227 D01 SAR meas for 802 11abg v01r02 FCC KDB 941225 D03 SAR Test Reduction GSM GPRS EDGE v01
Performed Date:	1th ~13rd Jun. 2015
Test Engineer:	Li.zhao
Reviewed By	Tommy. Liu
Performed Location:	Shenzhen Sunway Communication CO.,LTD Testing Center 1/F,BuildingA，SDG Info Port, KefengRoad，Hi-Tech Park, Nanshan District,Shenzhen , Guangdong, China 518104 Tel: +86-755- 36615880 Fax: +86-755- 86525532

3. General Information:

3.1 EUT Description:

EUT Information	
Product Name	Smart Phone
Brand Name	SENWA
Model Name	S915
Hardware Version	DRT_S915_SENWA_6582_8G+1G_LCD_-rm68191_V1.0_20150312
Software Version	SENWA_S915_V13_20150509
Antenna gain:	GSM 850:-0.42dBi PCS 1900:1.53dBi WCDMA 850: -0.42dBi WCDMA 1900:1.53dBi
AC adapter:	Input:100-240V AC,50/60Hz 0.3A Output:5V DC MAX 1A
Power supply:	Rechargeable Li-ion Battery DC3.8V-2500mAh
Tx Frequency	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	GSM/GPRS RMC/AMR 12.2Kbps HSDPA HSUPA 802.11b/g/n HT20/HT40 Bluetooth v3.0+EDR Bluetooth v4.0 LE
GSM/(E)GPRS Transfer mode	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.

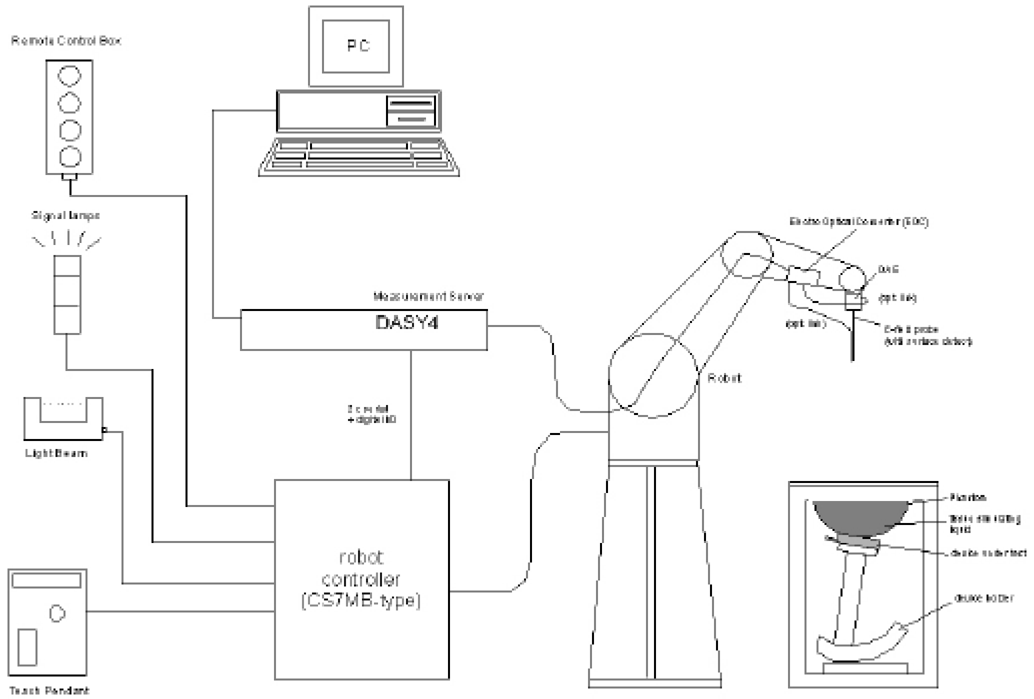
3.2 Test Environment:

Ambient conditions in the SAR laboratory:

Items	**Required**	**Actual**
Temperature (℃)	18-25	22~23
Humidity (%RH)	30-70	55~65

4. SAR Measurement System:

4.1 Dasy4 System Description:



The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc.
- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.
- DASY4 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validate the proper functioning of the system.

5. System Components:

➢ DASY4 Measurement Server:

Calibration: No calibration required.

The DASY4 measurement server is based on a PC/104 CPU board with a 166MHz low-power pentium, 32MB chipdisk and 64MB RAM. The necessary circuits for communication with either the DAE4 (or DAE3) electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY4 I/O-board, which is directly connected to the PC/104 bus of the CPU board.

➢ DATA Acquisition Electronics (DAE):

Calibration: Recommended once a year

The data acquisition electronics 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.

➢ Dosimetric Probes:

Calibration: Recommended once a year

Model: ES3DV3,
Frequency: 10MHz to 3G, Linearity:±0.2dB,
Dynamic Range: 10 µW/g to100 mW/g
Directivity:
± 0.3 dB in HSL (rotation around probe axis)
± 0.5 dB in tissue material (rotation normal to probe axis)

These probes are specially designed and calibrated for use in liquids with high permittivities. They should not be used in air, since the spherical isotropy in air is poor (±2 dB). The dosimetric probes have special calibrations in various liquids at different frequencies.

➢ Light Beam unit:

Calibration: No calibration required.

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 than 0.1 mm.

➢ SAM Twin Phantom:

The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region where shell thickness increases to 6mm). It has three measurement areas:

• Left hand
• Right hand
• Flat 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.

➢ Device Holder for SAM Twin Phantom:

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 centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity "=3 and loss tangent _=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

6. Tissue Simulating Liquid

6.1 The composition of the tissue simulating liquid:

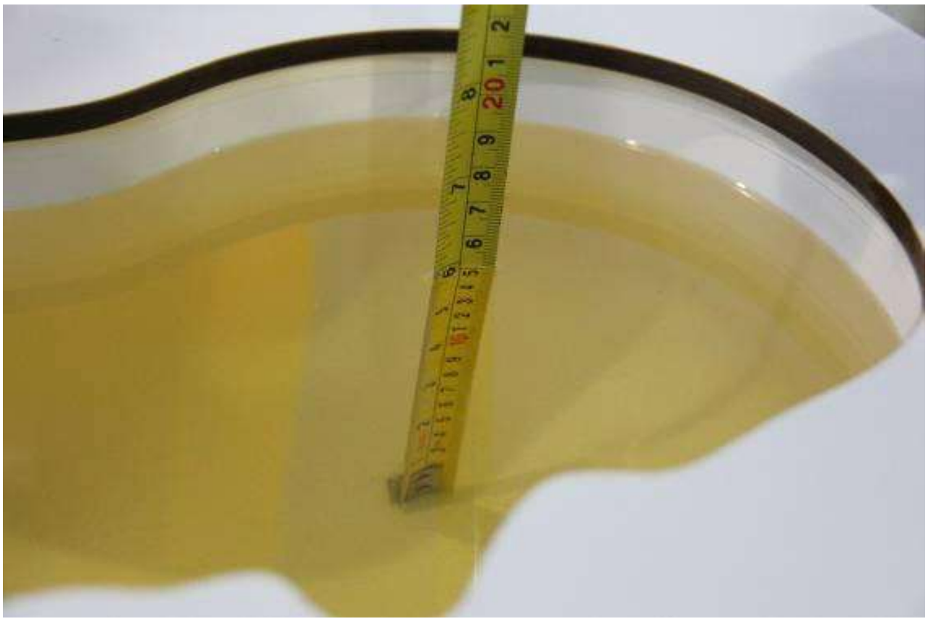
The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1750	55.2	0	0	0.3	0	44.5	1.37	40.1
1800,1900,2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
For Body								
900	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1750	70.2	0	0	0.4	0	29.4	1.49	53.4
1800,1900,2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7

6.2 Tissue Calibration Result:

Frequency (MHz)	Description	Dielectric Parameters		Tissue Temp. (℃)	Date
		Permittivity (εr)	Conductivity (σ)		
900 (Head)	Reference	41.50±5% (39.425~43.574)	0.97±5% (0.9215~1.0185)	NA	2015/06/01
	Measurement	42.14	0.98	22.5	
1900 (Head)	Reference	40.00±5% (38.00~42.00)	1.40±5% (1.33~1.47)	NA	2015/06/13
	Measurement	40.3	1.46	22.7	
2450 (Head)	Reference	39.2±5% (37.24~41.16)	1.80±5% (1.71~1.89)	NA	2015/06/02
	Measurement	38.2	1.84	22.1	

Frequency (MHz)	Description	Dielectric Parameters		Tissue Temp. (℃)	Date
		Permittivity (εr)	Conductivity (σ)		
900 (Body)	Reference	55.2±5% (52.44~57.96)	0.97±5% (0.9215~1.0185)	NA	2015/06/02
	Measurement	54.7	0.96	22.4	
1900 (Body)	Reference	53.3±5% (50.635~55.965)	1.52±5% (1.444~1.596)	NA	2015/06/12
	Measurement	53.5	1.51	22.8	
2450 (Body)	Reference	52.7±5% (50.065~55.335)	1.95±5% (1.8525~2.0475)	NA	2015/06/02
	Measurement	50.6	1.87	22.6	



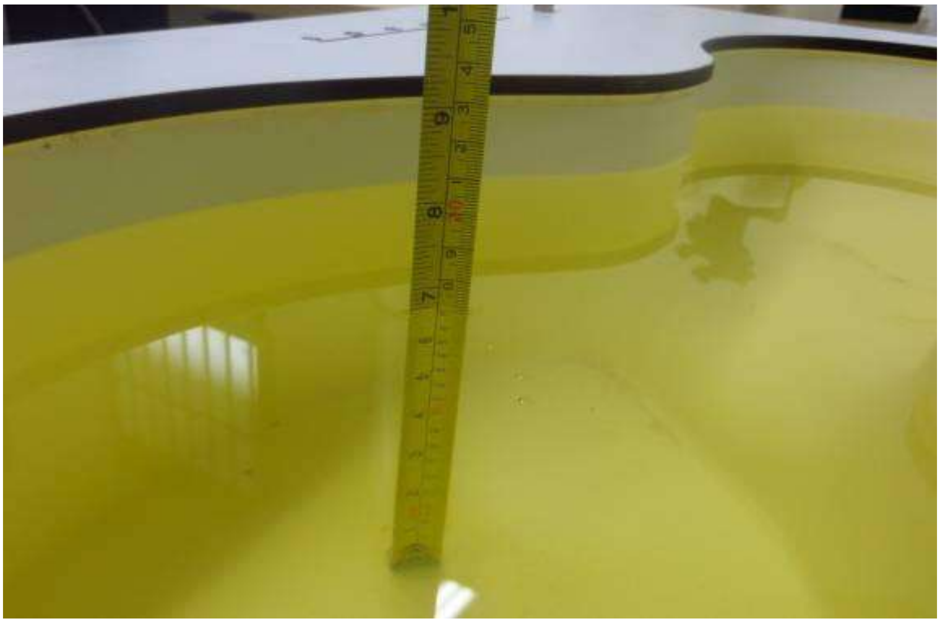
Liquid depth in the Head Phantom (900 MHz) (depth>15cm)

Liquid depth in the Flat Phantom (900 MHz) (depth>15cm)

Liquid depth in the Head Phantom (1900 MHz) (depth>15cm)

Liquid depth in the Body Phantom (1900 MHz) (depth>15cm)

Liquid depth in the Head Phantom (2450 MHz) (depth>15cm)

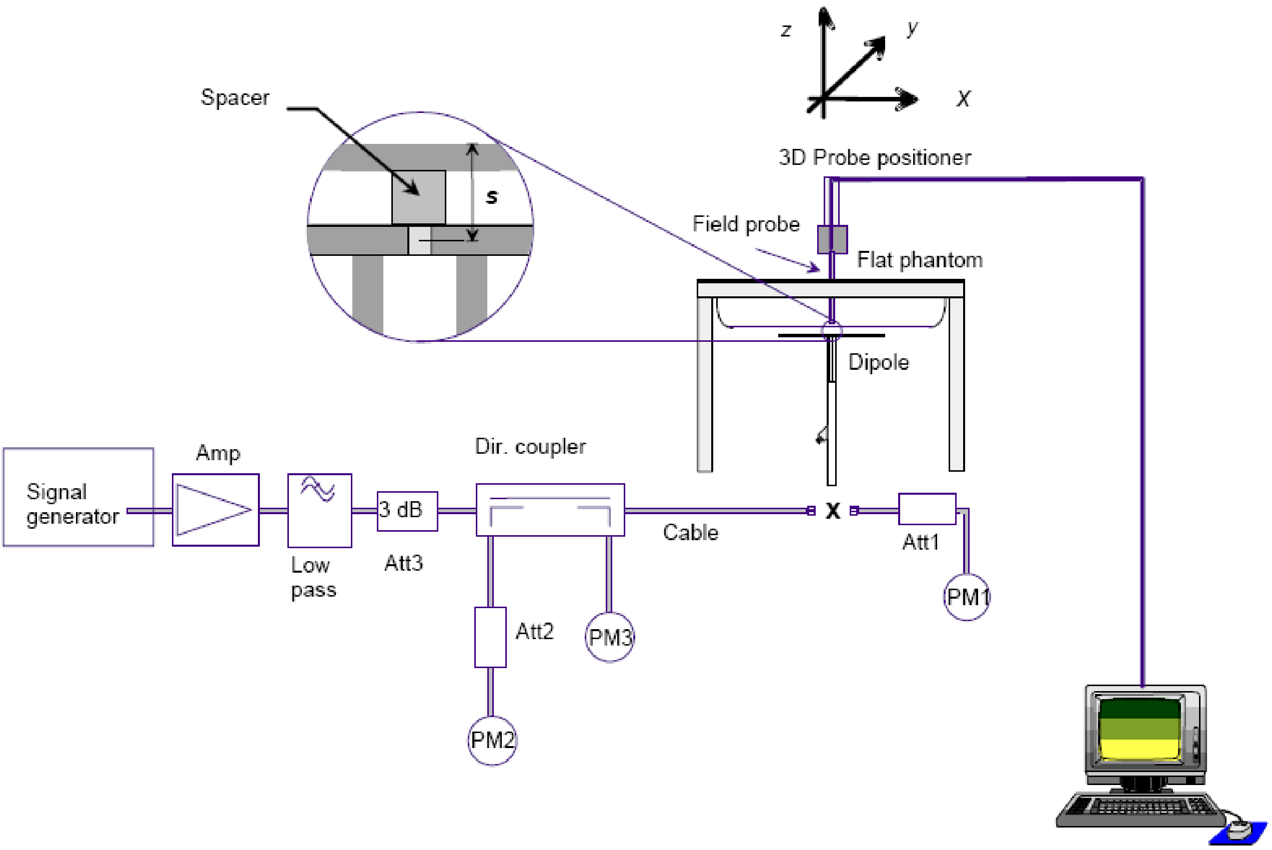


Liquid depth in the Flat Phantom (2450 MHz) (depth>15cm)

7. SAR System Validation

7.1 Validation System:

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:



7.2 Validation Dipoles:

The dipoles used is based on the IEEE-1528/EN62209-1 standard, and is complied with mechanical and electrical specifications in line with the requirements of both IEEE-1528/EN62209-1 and FCC Supplement C.

7.3 Validation Result:

Frequency (MHz)	Description	SAR(1g) W/Kg	SAR(10g) W/Kg	Tissue Temp. (℃)	Date
900 (Head)	Reference	10.7±10% (9.63~11.77)	6.87±10% (6.18~7.49)	NA	2015/06/01
	Measurement	10.72	6.92	22.5	
1900 (Head)	Reference	40.6±10% (36.54~44.66)	21.3±10% (19.17~23.43)	NA	2015/06/13
	Measurement	39.52	21.05	22.7	
2450 (Head)	Reference	51.6±10% (46.44~56.76)	23.9±10% (21.51~26.29)	NA	2015/06/02
	Measurement	53.6	25.84	22.1	
900 (Body)	Reference	10.7±10% (9.63~11.77)	6.94±10% (6.246~7.634)	NA	2015/06/02
	Measurement	9.8	6.44	22.4	
1900 (Body)	Reference	40.1±10% (36.09~44.11)	21.3±10% (19.17~23.43)	NA	2015/06/12
	Measurement	41.6	21.72	22.8	
2450 (Body)	Reference	51.8±10% (46.62~56.98)	24.2±10% (21.78~26.62)	NA	2015/06/02
	Measurement	54.4	25.4	22.6	

8. SAR Evaluation Procedures:

The procedure for assessing the average SAR value consists of the following steps:

- Power Reference Measurement

  The Power Reference Measurement and Power Drift Measurement jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

- Area Scan

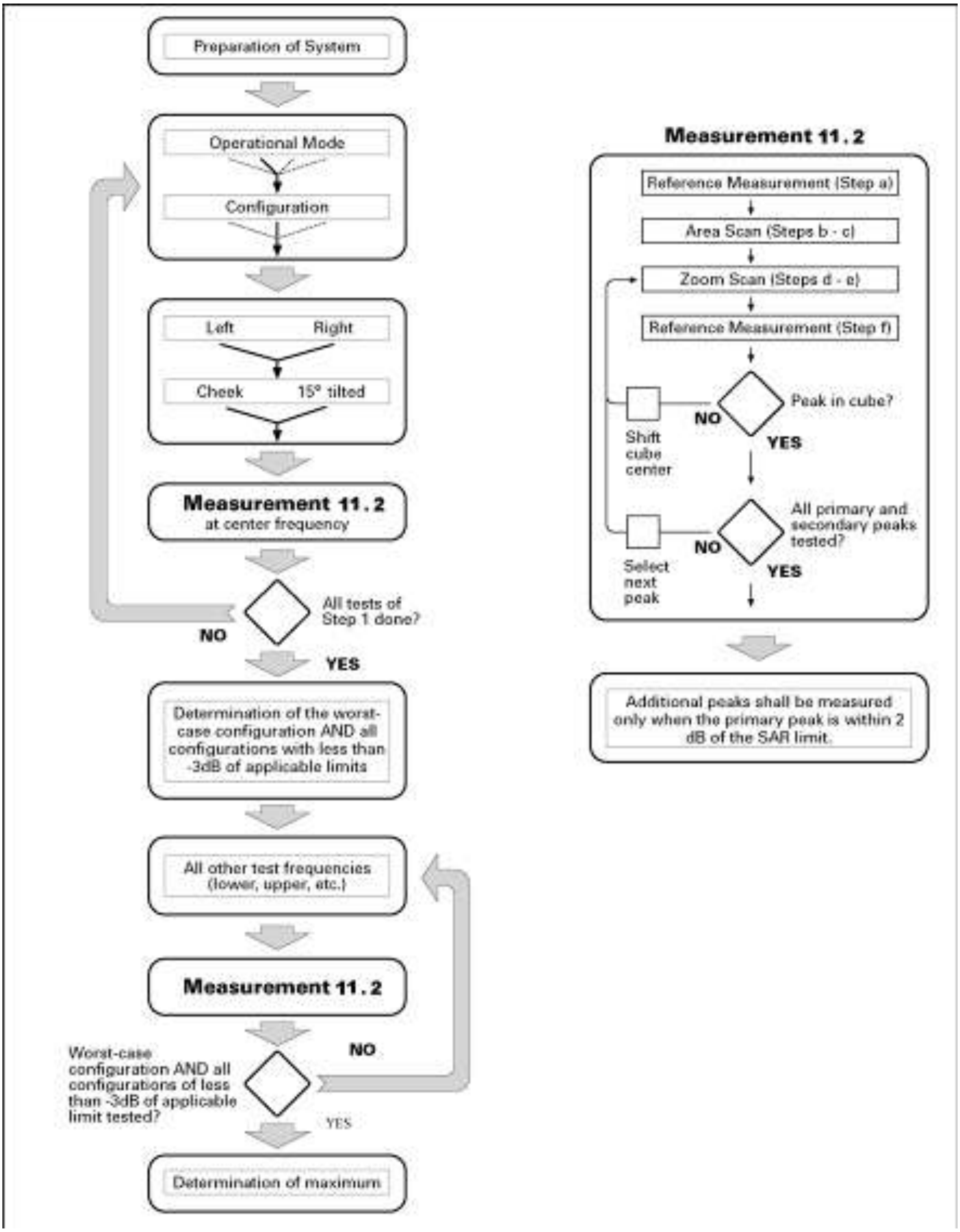
  The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a finer measurement around the hot spot. The sophisticated interpolation routines implemented in DASY4 software can find the maximum locations even in relatively coarse grids. The scanning area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the Area Scan's property sheet is brought-up, grid settings can be edited by a user.

- Zoom Scan

  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. The default Zoom Scan measures 7 x 7 x 7 points (5mmx5mmx5mm) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure.

- Power Drift Measurement

  The Power Drift Measurement job measures the field at the same location as the most recent power reference measurement job within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement.



Block diagram of the tests to be performed

9. SAR Exposure Limits

9.1 Uncontrolled Environment

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

9.2 Controlled Environment

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

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

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

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

10. Measurement Uncertainty:

NO	Source	Uncert. ai（%）	Prob. Dist.	Div. k	ci (1g)	ci (10g)	Stand. Uncert. ui (1g)	Stand. Uncert. ui (10g)	*Veff*
1	Repeat	0.04	N	1	1	1	0.04	0.04	9
Instrument									
2	Probe calibration	7	N	2	1	1	3.5	3.5	∞
3	Axial isotropy	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
4	Hemispherical isotropy	9.6	R	$\sqrt{3}$	0.7	0.7	3.9	3.9	∞
5	Boundary effect	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Linearity	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
7	Detection limits	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
8	Readout electronics	0.3	N	1	1	1	0.3	0.3	∞
9	Response time	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
10	Integration time	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
11	Ambient noise	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
12	Ambient reflections	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
13	Probe positioner mech. restrictions	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
14	Probe positioning with respect to phantom shell	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
15	Max.SAR evaluation	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Test sample related									
16	Device positioning	3.8	N	1	1	1	3.8	3.8	99

17	Device holder	5.1	N	1	1	1	5.1	5.1	5
18	Drift of output power	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up									
19	Phantom uncertainty	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
20	Liquid conductivity (target)	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
21	Liquid conductivity (meas)	2.5	N	1	0.64	0.43	1.6	1.2	∞
22	Liquid Permittivity (target)	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.5	∞
23	Liquid Permittivity (meas)	2.5	N	1	0.6	0.49	1.5	1.2	∞
Combined standard			RSS	$U_C = \sqrt{\sum_{i=1}^{n} C_i^2 U_i^2}$			12.2%	11.9%	236
Expanded uncertainty (P=95%)		$U = k\ U_C$,k=2					**24.4%**	**23.8%**	

11. Conducted Power Measurement:

<GSM Conducted Power>

General Note:

1. Per KDB 447498 D01v05r02, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. According to October 2013TCB Workshop, for GSM / GPRS, the number of time slots to test for SAR should correspond to the highest frame-average maximum output power configuration, considering the possibility of e.g. 3rd party VoIP operation for head and body-worn SAR testing, the EUT was set in GPRS (4Tx slot) for GSM850/GSM1900 band due to their highest frame-average power.
3. For hotspot mode SAR testing, GPRS should be evaluated, therefore the EUT was set in GPRS 4 Tx slots for GSM850/GSM1900 band due to its highest frame-average power.

Band GSM850	**Burst Average Power (dBm)**			**Frame-Average Power (dBm)**		
TX Channel	**128**	**189**	**251**	**128**	**189**	**251**
Frequency (MHz)	**824.2**	**836.4**	**848.8**	**824.2**	**836.4**	**848.8**
GSM (GMSK, 1 Tx slot)	31.98	**31.99**	31.92	22.98	22.99	22.92
GPRS (GMSK, 1 Tx slot) – CS1	31.97	31.95	31.93	22.97	22.95	22.93
GPRS (GMSK, 2 Tx slots) – CS1	30.84	30.82	30.83	24.84	24.82	24.83
GPRS (GMSK, 3 Tx slots) – CS1	29.21	29.16	29.13	24.95	24.90	24.87
GPRS (GMSK, 4 Tx slots) – CS1	**27.96**	**27.76**	**27.88**	**24.96**	**24.76**	**24.88**
Band GSM1900	**Burst Average Power (dBm)**			**Frame-Average Power (dBm)**		
TX Channel	**512**	**661**	**810**	**512**	**661**	**810**
Frequency (MHz)	**1850.2**	**1880**	**1909.8**	**1850.2**	**1880**	**1909.8**
GSM (GMSK, 1 Tx slot)	**30.24**	30.02	30.04	21.24	21.02	21.04
GPRS (GMSK, 1 Tx slot) – CS1	30.15	30.08	30.10	21.15	21.08	21.10
GPRS (GMSK, 2 Tx slots) – CS1	29.20	29.14	29.18	23.20	23.14	23.18
GPRS (GMSK, 3 Tx slots) – CS1	27.20	27.24	27.34	22.94	22.98	23.08
GPRS (GMSK, 4 Tx slots) – CS1	**26.03**	**26.11**	**26.21**	**23.03**	**23.11**	**23.21**

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB
Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

<WCDMA Conducted Power>

The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification. A summary of these settings are illustrated below:

HSDPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set Gain Factors (β_c and β_d) and parameters were set according to each
   ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
   iii. Set RMC 12.2Kbps + HSDPA mode.
   iv. Set Cell Power = -86 dBm
   v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   vi. Select HSDPA Uplink Parameters
   vii. Set Delta ACK, Delta NACK and Delta CQI = 8
   viii. Set Ack-Nack Repetition Factor to 3
   ix. Set CQI Feedback Cycle (k) to 4 ms
   x. Set CQI Repetition Factor to 2
   xi. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with $\beta_{hs} = 30/15 * \beta_c$.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 30/15 with $\beta_{hs} = 30/15 * \beta_c$, and Δ_{CQI} = 24/15 with $\beta_{hs} = 24/15 * \beta_c$.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

Setup Configuration

HSUPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting * :
  i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
  ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
  iii. Set Cell Power = -86 dBm
  iv. Set Channel Type = 12.2k + HSPA
  v. Set UE Target Power
  vi. Power Ctrl Mode= Alternating bits
  vii. Set and observe the E-TFCI
  viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI
d. The transmitted maximum output power was recorded.

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 5) (Note 6)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 6)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed}1: 47/15 β_{ed}2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.
Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.
Note 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.

Setup Configuration

General Note

1. Per KDB 941225 D01 v02, RMC 12.2kbps setting is used to evaluate SAR. If AMR 12.2kbps power is < 0.25dB higher than RMC 12.2kbps, SAR tests with AMR 12.2kbps can be excluded.
2. By design, AMR and HSDPA/HSUPA RF power will not be larger than RMC 12.2kbps, detailed information is included in Tune-up Procure exhibit.
3. It is expected by the manufacturer that MPR for some HSDPA/HSUPA subtests may differ from the specification of 3GPP, according to the chipset implementation in this model. The implementation and expected deviation are detailed in tune-up procedure exhibit.

Band	**WCDMA II**			**WCDMA V**		
TX Channel	**9262**	**9400**	**9538**	**4132**	**4183**	**4233**
Rx Channel	**9662**	**9800**	**9938**	**4357**	**4408**	**4458**
Frequency (MHz)	**1852.4**	**1880**	**1907.6**	**826.4**	**836.6**	**846.6**
AMR 12.2Kbps	23.75	23.58	23.55	23.60	24.21	23.39
RMC 12.2Kbps	**23.85**	23.61	23.57	23.62	**24.28**	23.40
HSDPA Subtest-1	21.65	20.84	20.09	21.58	21.36	21.13
HSDPA Subtest-2	21.30	20.42	20.14	21.12	20.90	20.52
HSDPA Subtest-3	19.67	18.72	18.85	19.44	19.27	18.83
HSDPA Subtest-4	19.65	18.83	18.83	19.41	19.26	18.77
HSUPA Subtest-1	21.55	20.68	20.34	21.58	21.36	21.13
HSUPA Subtest-2	21.65	20.74	20.77	21.12	20.90	20.52
HSUPA Subtest-3	19.58	18.81	18.89	19.44	19.27	18.83
HSUPA Subtest-4	21.72	20.80	20.36	19.41	19.26	18.77
HSUPA Subtest-5	20.75	19.79	19.93	21.58	21.36	21.13

<WLAN 2.4GHz Conducted Power>

Mode	Channel	Frequency (MHz)	Conducted Output Power(dBm)	Test Rate Data
802.11b	1	2412	14.11	1 Mbps
	6	2437	14.50	1 Mbps
	11	2462	**14.80**	1 Mbps
802.11g	1	2412	10.88	6 Mbps
	6	2437	12.45	6 Mbps
	11	2462	11.75	6 Mbps
802.11n(20MHz)	1	2412	10.98	6.5 Mbps
	6	2437	**12.41**	6.5 Mbps
	11	2462	11.75	6.5 Mbps
802.11n(40MHz)	1	2412	9.37	13.5Mbps
	6	2437	11.50	13.5Mbps
	11	2462	9.83	13.5Mbps

Note:

1. Per KDB 447498 D01v05r02, the 1-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
[(*max. power of channel, including tune-up tolerance, mW*) / (*min. test separation distance, mm*)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, where
- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

Channel	Frequency (GHz)	Max. Tune-up Power (dBm)	Max. Power (mW)	Test distance (mm)	Result	exclusion thresholds for 1-g SAR
b/CH 11	2.462	15	31.62	5	9.96	3.0
n20/CH 6	2.437	13	19.95	5	6.28	3.0

2. Base on the result of note1, RF exposure evaluation of 802.11 b mode is required.
3. Per KDB 248227 D01v02, choose the highest output power channel to test SAR and determine further SAR exclusion.
4. Per KDB 248227 D01v02, In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. SAR is not required for the following 2.4 GHz OFDM conditions:
   1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
   2) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
5. The output power of all data rate were pre-scan, just the worst case (the lowest data rate) of all mode were shown in report.
6. Per KDB 248227 D01V02 section 2.2, when the EUT in continuously transmitting mode, the actual duty cycle is 98.4%, so the duty cycle factor is 1.02.

<Bluetooth Conducted Power>

Mode Band	Average power(dBm)	
	Bluetooth v3.0+EDR	Bluetooth v4.0 LE
2.4GHz Bluetooth	**1.58**	-2.33

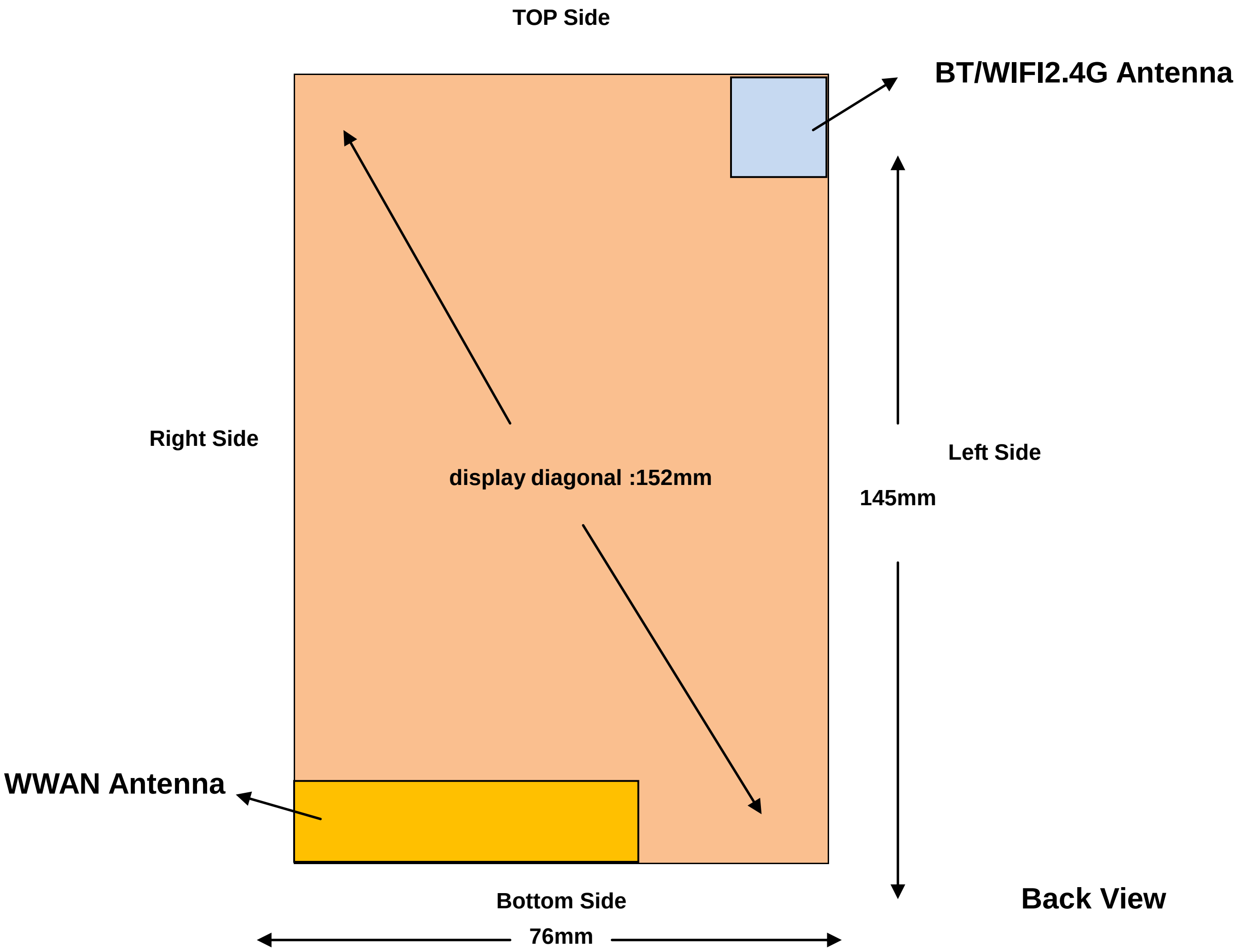
Per KDB 447498 D01v05r02, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·[$\sqrt{f(GHz)}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

Bluetooth Turn up Power (dBm)	Separation Distance (mm)	Frequency (GHz)	exclusion thresholds
2	0	2.48	0.5

Per KDB 447498 D01v05r02, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion. The test exclusion threshold is 0.5 which is <= 3, SAR testing is not required.

12. Antenna Location



Distance of The Antenna to the EUT surface and edge						
Antennas	**Front**	**Back**	**Top Side**	**Bottom Side**	**Left Side**	**Right Side**
WWAN	/	/	>25mm	/	<25mm	/
BT&WLAN	/	/	/	>25mm	/	>25mm

Positions for SAR tests; Hotspot mode						
Antennas	**Front**	**Back**	**Top Side**	**Bottom Side**	**Left Side**	**Right Side**
WWAN	Yes	Yes	No	Yes	Yes	Yes
BT&WLAN	Yes	Yes	Yes	No	Yes	No

General Note: Referring to KDB 941225 D06 v01r01, When the overall device length and width are ≥9cm*5cm, the test distance is 10mm, SAR must be measured for all sides and surfaces with a transmitting antenna located with 25mm from that surface or edge.

13. Results and Test photos :

13.1 SAR result summary:

Head

Test Case of Head			Meas. Power (dBm)	Target Power (dBm)	Factor	Meas. SAR (W/kg) 1g Avg.	Scale SAR (W/kg)	Power Drift <±0.2 dB	Plot
Band	Test Position	CH							
GSM 850	Right Cheek	Ch189	31.99	32.50	1.125	0.202	0.227	0.064	
	Right Tilt	Ch189	31.99	32.50	1.125	0.135	0.152	0.038	
	Left Cheek	Ch189	31.99	32.50	1.125	0.265	**0.298**	-0.113	**#1**
	Left Tilt	Ch189	31.99	32.50	1.125	0.118	0.133	0.054	
GSM 1900	Right Cheek	Ch512	30.24	30.50	1.062	0.262	**0.278**	0.044	**#2**
	Right Tilt	Ch512	30.24	30.50	1.062	0.0694	0.074	0.011	
	Left Cheek	Ch512	30.24	30.50	1.062	0.212	0.225	0.118	
	Left Tilt	Ch512	30.24	30.50	1.062	0.066	0.070	0.088	
WCDM A Band V	Right Cheek	Ch4183	24.28	24.50	1.052	0.214	0.225	-0.150	
	Right Tilt	Ch4183	24.28	24.50	1.052	0.136	0.143	0.149	
	Left Cheek	Ch4183	24.28	24.50	1.052	0.248	**0.261**	0.130	**#3**
	Left Tilt	Ch4183	24.28	24.50	1.052	0.119	0.125	0.063	
WCDM A Band II	Right Cheek	Ch9262	23.85	24.00	1.035	0.358	0.371	-0.086	
	Right Tilt	Ch9262	23.85	24.00	1.035	0.111	0.115	0.000	
	Left Cheek	Ch9262	23.85	24.00	1.035	0.360	**0.373**	0.192	**#4**
	Left Tilt	Ch9262	23.85	24.00	1.035	0.122	0.126	-0.134	

Test Case of Head			Meas. Power (dBm)	Target Power (dBm)	Factor	D.C Factor	Meas. SAR (W/kg) 1g	Scale SAR (W/kg)	Power Drift(dB)	Plot
Band	Test Position	CH								
WLA N2.4 G	Right Cheek	Ch11	14.80	15.00	1.047	1.02	0.379	**0.405**	-0.052	**#5**
	Right Tilt	Ch11	14.80	15.00	1.047	1.02	0.306	0.327	-0.028	
	Left Cheek	Ch11	14.80	15.00	1.047	1.02	0.095	0.101	0.140	
	Left Tilt	Ch11	14.80	15.00	1.047	1.02	0.084	0.0897	0.051	

Body Hotspot (10mm between DUT and Flat Phantom)

Test Case of Head			Meas. Power (dBm)	Target Power (dBm)	Factor	Meas. SAR (W/kg) 1g Avg.	Scale SAR (W/kg)	Power Drift <±0.2 dB	Plot
Band	**Test Position**	**CH**							
GPRS 850(4 Tx slots)	Front	Ch189	27.76	28.00	1.057	0.412	0.435	0.130	
	Back	Ch189	27.76	28.00	1.057	0.554	0.585	-0.006	
	Left Side	Ch189	27.76	28.00	1.057	0.609	**0.644**	0.110	**#6**
	Right Side	Ch189	27.76	28.00	1.057	0.307	0.324	0.076	
	Bottom Side	Ch189	27.76	28.00	1.057	0.375	0.396	0.175	
GPRS 1900(4 Tx slots)	Front	Ch512	26.03	26.50	1.114	0.265	0.295	0.006	
	Back	Ch512	26.03	26.50	1.114	0.406	0.452	-0.099	
	Left Side	Ch512	26.03	26.50	1.114	0.029	0.033	0.026	
	Right Side	Ch512	26.03	26.50	1.114	0.078	0.087	0.177	
	Bottom Side	Ch512	26.03	26.50	1.114	0.657	**0.732**	0.144	**#7**
WCDMA Band V	Front	Ch4183	24.28	24.50	1.052	0.268	0.282	0.086	
	Back	Ch4183	24.28	24.50	1.052	0.271	0.285	-0.020	
	Left Side	Ch4183	24.28	24.50	1.052	0.295	**0.310**	-0.062	**#8**
	Right Side	Ch4183	24.28	24.50	1.052	0.146	0.154	0.156	
	Bottom Side	Ch4183	24.28	24.50	1.052	0.219	0.230	-0.172	
WCDMA Band II	Front	Ch9262	23.85	24.00	1.035	0.604	0.625	0.151	
	Back	Ch9262	23.85	24.00	1.035	0.712	0.737	-0.094	
	Left Side	Ch9262	23.85	24.00	1.035	0.143	0.148	0.053	
	Right Side	Ch9262	23.85	24.00	1.035	0.216	0.224	0.162	
	Bottom Side	Ch9262	23.85	24.00	1.035	1.010	**1.05**	-0.159	**#9**
	Bottom Side(Repeat)	**Ch9262**	**23.85**	**24.00**	**1.035**	**0.987**	**1.02**	**-0.124**	
	Bottom Side	Ch9400	23.61	24.00	1.094	0.910	0.996	0.020	
	Bottom Side	Ch9583	23.57	24.00	1.104	0.698	0.771	0.131	

Test Case of Head			Meas. Power (dBm)	Target Power (dBm)	Factor	D.C Factor	Meas. SAR (W/kg) 1g	Scale SAR (W/kg)	Power Drift(dB)	Plot
Band	Test Position	CH								
WLAN 2.4G	Front	Ch11	14.80	15.00	1.047	1.02	0.108	0.115	0.094	
	Back	Ch11	14.80	15.00	1.047	1.02	0.186	0.199	0.114	
	Left Side	Ch11	14.80	15.00	1.047	1.02	0.200	**0.214**	0.166	**#10**
	Top	Ch11	14.80	15.00	1.047	1.02	0.021	0.022	0.058	

Body Worn (10mm between DUT and Flat Phantom

Test Case of Head			Meas. Power (dBm)	Target Power (dBm)	Factor	Meas. SAR (W/kg) 1g Avg.	Scale SAR (W/kg)	Power Drift <±0.2 dB
Band	**Test Position**	**CH**						
GPRS 850(4 Tx slots)	Front	Ch189	27.76	28.00	1.057	0.412	0.435	0.130
	Back	Ch189	27.76	28.00	1.057	0.554	**0.585**	-0.006
GPRS 1900(4 Tx slots)	Front	Ch512	26.03	26.50	1.114	0.265	0.295	0.006
	Back	Ch512	26.03	26.50	1.114	0.406	**0.452**	-0.099
WCDMA Band V	Front	Ch4183	24.28	24.50	1.052	0.268	0.282	0.086
	Back	Ch4183	24.28	24.50	1.052	0.271	**0.285**	-0.020
WCDMA Band II	Front	Ch9262	23.85	24.00	1.035	0.604	0.625	0.151
	Back	Ch9262	23.85	24.00	1.035	0.712	**0.737**	-0.094

13.2 Evaluation of Simultaneous :

BT* - Estimated SAR for Bluetooth

(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[$\sqrt{f_{(GHz)}}/x$] W/kg for *test separation distances* ≤ 50 mm;

where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.

Maximum Turn up Power	Exposure Position	Head	Hotspot	Body-worn
	Test separation	**0 mm**	**10 mm**	**10 mm**
2dBm	Estimated SAR (W/kg)	0.067W/kg	0.033W/kg	0.033W/kg

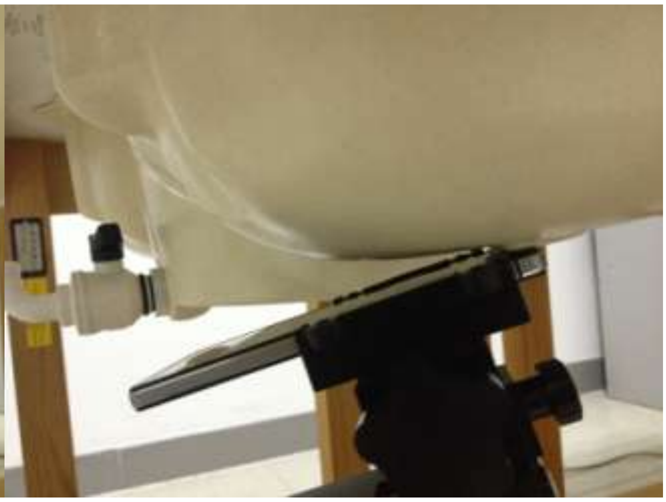
Conclusion:
According to the above table, the sum of reported SAR values for GSM/WCDMA and WIFI/BT ＜1.6W/kg. So the simultaneous transmission SAR is not required for WIFI/BT transmitter.

13.3 DUT and setup photos photos:

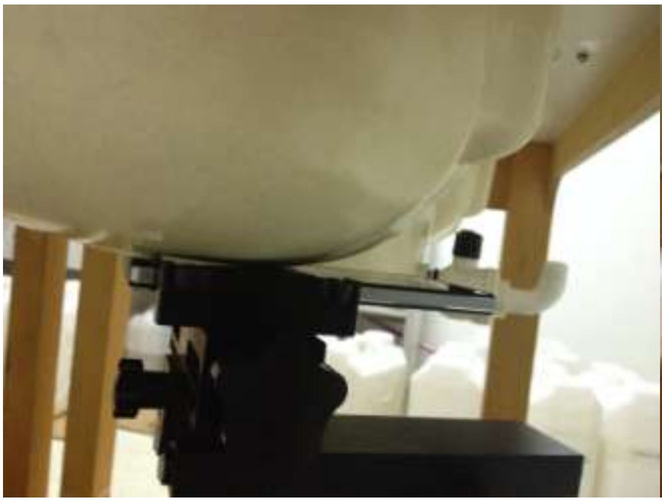
Front

Back

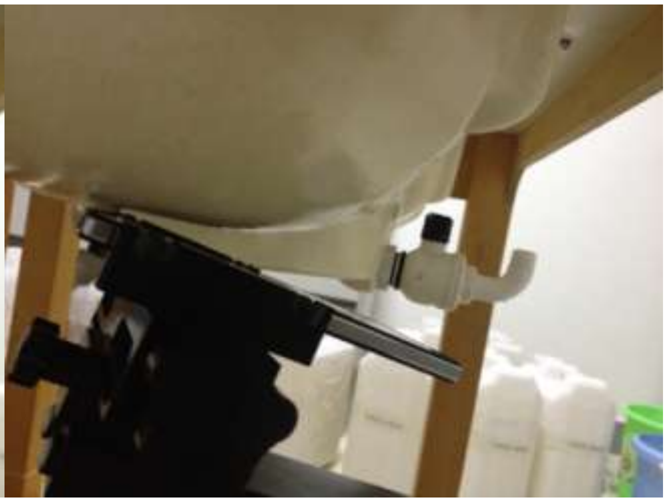
Left Cheek



Left Tilt

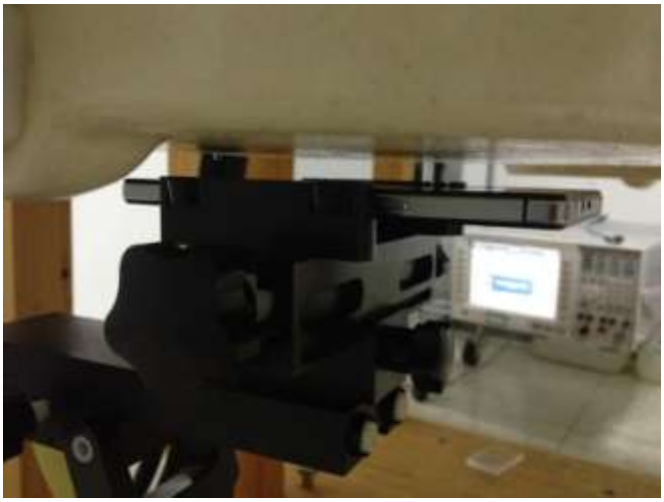


Right Cheek



Right Tilt


Front of the EUT with 1 cm Gap


Back of the EUT with 1 cm Gap


Left of the EUT with 1 cm Gap


Right of the EUT with 1 cm Gap


Top of the EUT with 1 cm Gap


Bottom of the EUT with 1 cm Gap

14. Equipment List:

NO.	Instrument	Manufacturer	Model	S/N	Cal. Date	Cal. Due Date
1	Communication Tester	Agilent	E5515C	MY50267264	Dec 27th 2014	Dec 26th 2015
2	E-field Probe	Speag	ES3DV3	3028	Oct 22th 2014	Oct 21th 2015
3	Dielectric Probe Kit	Speag	DAK	1038	N/A	N/A
4	DAE	Speag	DAE4	689	Oct 1th 2014	Sep 30th 2015
5	SAM TWIN phantom	Speag	SAM	1360/1432	N/A	N/A
6	Robot	Stabuli	TX60L	N/A	N/A	N/A
7	Device Holder	Speag	SD000H01HA	N/A	N/A	N/A
8	Vector Network	Agilent	E5071C	MY46107615	Jan 6th 2015	Jan 7th 2016
9	Signal Generator	Agilent	E4438C	MY49072279	Nov 27th 2014	Nov 26th 2015
10	Amplifier	Mini-circult	ZHL-42W	QA098002	N/A	N/A
11	Power Meter	Agilent	N1419A	MY50001563	Nov 27th 2014	Nov 26th 2015
12	Power Sensor	Agilent	N8481H	MY51020010	Nov 27th 2014	Nov 26th 2015
13	Directional Coupler	Agilent	772D	MY46151275	Nov 27th 2014	Nov 26th 2015
14	Directional Coupler	Agilent	778D	MY48220607	Nov 27th 2014	Nov 26th 2015
15	Dipole 900MHz	Speag	D900V2	1d086	Aug 9th 2013	Aug 8th 2016
16	Dipole 1900MHz	Speag	D1900V2	5d194	Jan 7th 2015	Aug 6th 2018
18	Dipole 2450MHz	Speag	D2450V2	955	Jan 8th 2015	Jan 7th 2018

Appendix A. System validation plots:

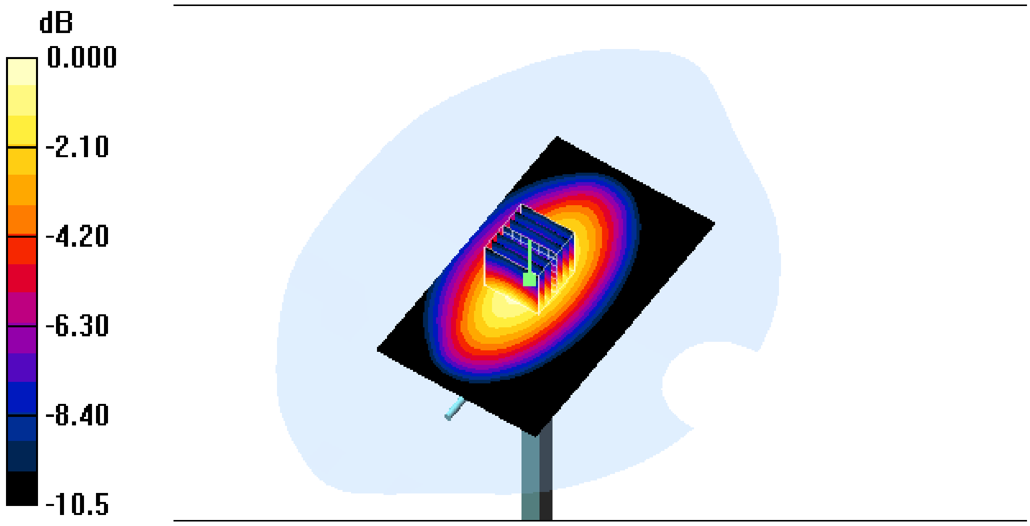
DUT: Dipole 900MHz; Type: D900V2; Serial: D900V2 - SN: 1d086
Program Name: System Performance Check at 900 MHz Head

Communication System: CW; Frequency: 900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 900 MHz; σ = 0.98 mho/m; ε_r = 42.14; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3028; ConvF(6.19, 6.19, 6.19); Calibrated:10/22/2014
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 10/1/2014
- Phantom: SAM 2; Type: SAM; Serial: TP-1432
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

d=15mm, Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.82 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.523 V/m; Power Drift = -0.01dB
Peak SAR (extrapolated) = 4.068 W/kg
SAR(1 g) = 2.68 mW/g; SAR(10 g) = 1.73 mW/g
Maximum value of SAR (measured) = 2.90 mW/g



0 dB = 2.90mW/g

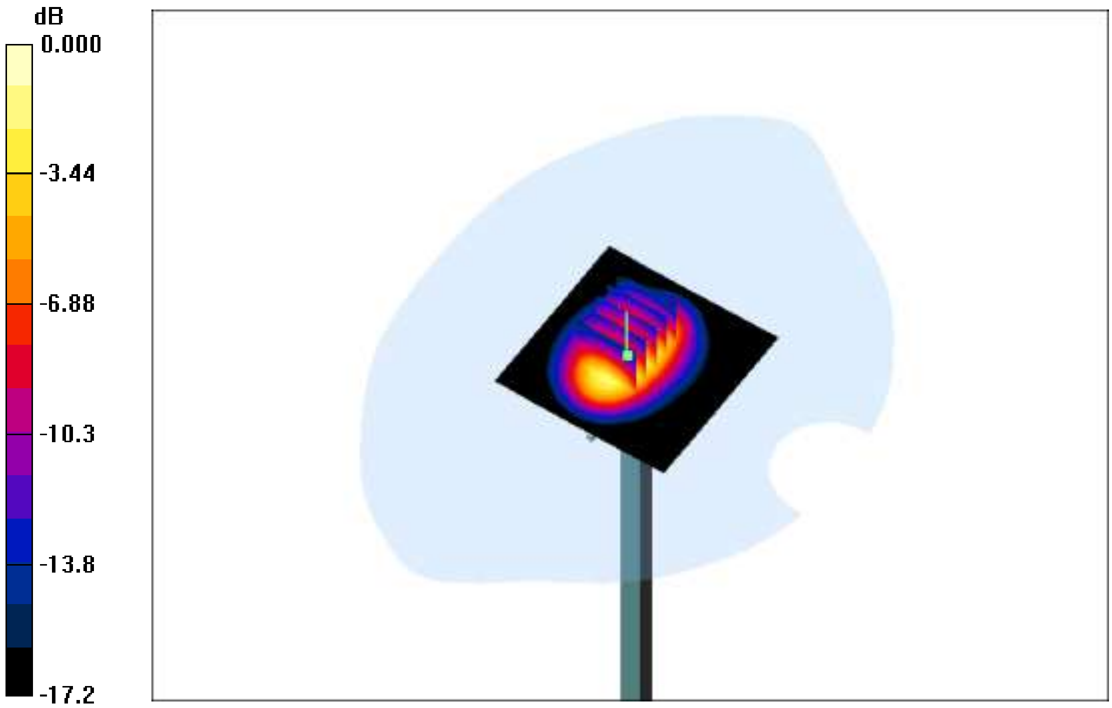
DUT: Dipole 1900MHz; Type: D1900V2; Serial: 5d194
Program Name: System Performance Check at 1900 MHz Head

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.46 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3028; ConvF(4.68, 4.68, 4.68); Calibrated: 10/22/2014
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 10/1/2014
- Phantom: SAM 1; Type: SAM; Serial: TP-1360
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

d=10mm, Pin=250mW/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 11.3 mW/g

d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 80.6 V/m; Power Drift = -0.005 dB
Peak SAR (extrapolated) = 17.5 W/kg
SAR(1 g) = 9.88 mW/g; SAR(10 g) = 5.27 mW/g
Maximum value of SAR (measured) = 11.2 mW/g



0 dB = 11.2mW/g

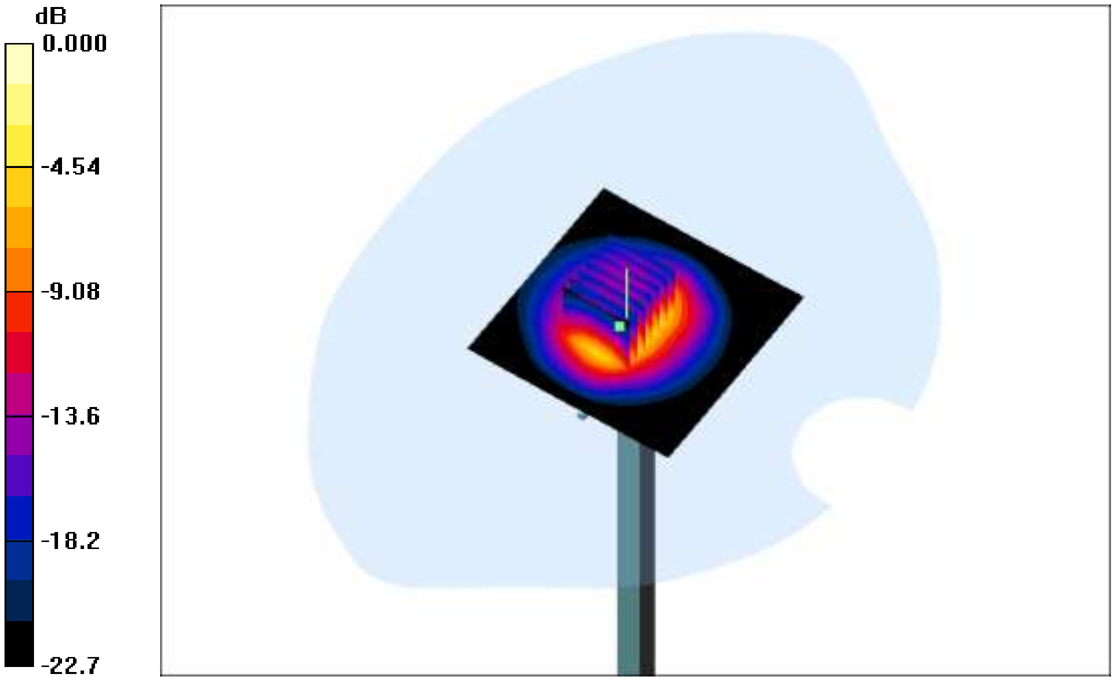
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 955
Program Name: System Performance Check at 2450 MHz Head

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.84 mho/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3028; ConvF(4.21, 4.21, 4.21); Calibrated: 10/22/2014
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 10/1/2014
- Phantom: SAM 1; Type: SAM; Serial: TP-1360
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

d=10mm, Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 16.7 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 87.0 V/m; Power Drift = 0.019 dB
Peak SAR (extrapolated) = 30.7 W/kg
SAR(1 g) = 13.4 mW/g; SAR(10 g) = 6.46 mW/g
Maximum value of SAR (measured) = 16.2 mW/g



0 dB = 16.2mW/g

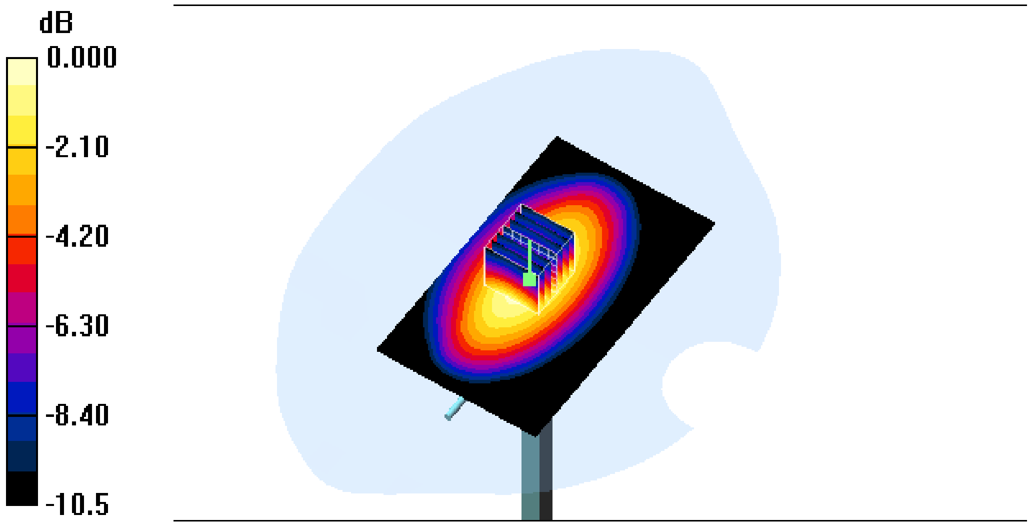
DUT: Dipole 900MHz; Type: D900V2; Serial: D900V2 - SN: 1d086
Program Name: System Performance Check at 900 MHz Body

Communication System: CW; Frequency: 900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 900 MHz; σ = 0.96 mho/m; ε_r = 54.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3028; ConvF(6.02, 6.02, 6.02); Calibrated:10/22/2014
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 10/1/2014
- Phantom: SAM 2; Type: SAM; Serial: TP-1432
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

d=15mm, Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.72 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.523 V/m; Power Drift = -0.01dB
Peak SAR (extrapolated) = 4.068 W/kg
SAR(1 g) = 2.45 mW/g; SAR(10 g) = 1.61 mW/g
Maximum value of SAR (measured) = 2.80 mW/g



0 dB = 2.90mW/g

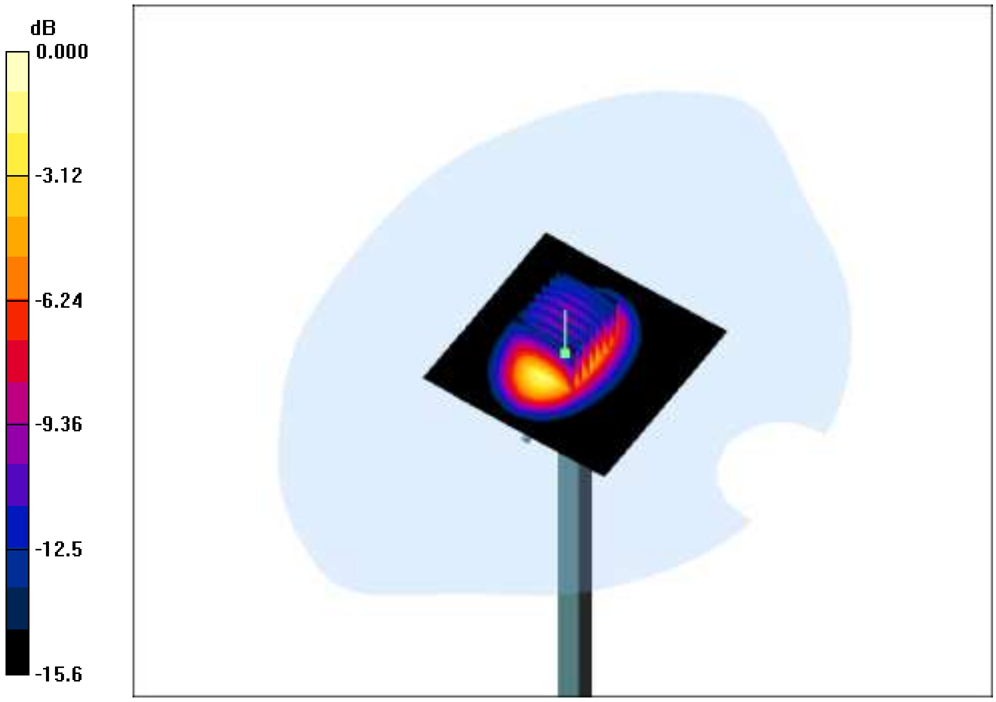
DUT: Dipole 1900MHz; Type: D1900V2; Serial: 5d194
Program Name: System Performance Check at 1900 MHz Body

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.46 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3028; ConvF(4.68, 4.68, 4.68); Calibrated: 10/22/2014
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 10/1/2014
- Phantom: SAM 1; Type: SAM; Serial: TP-1360
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

d=10mm, Pin=250mW/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 12.8 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 85.9 V/m; Power Drift = 0.109 dB
Peak SAR (extrapolated) = 19.7 W/kg
SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.43 mW/g
Maximum value of SAR (measured) = 12.5 mW/g



0 dB = 12.5mW/g

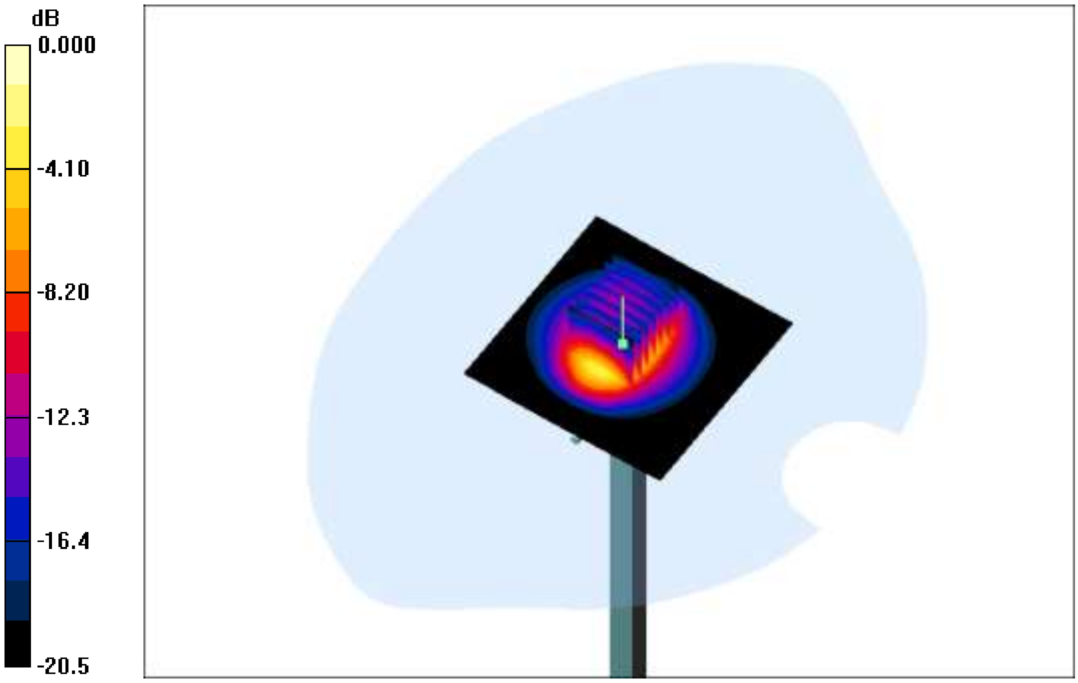
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 955
Program Name: System Performance Check at 2450 MHz Body

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.87 mho/m; ε_r = 50.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3028; ConvF(4.14, 4.14, 4.14); Calibrated: 10/22/2014
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 10/1/2014
- Phantom: SAM 1; Type: SAM; Serial: TP-1360
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

d=10mm, Pin=250mW/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 16.2 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.5 V/m; Power Drift = 0.017 dB
Peak SAR (extrapolated) = 27.0 W/kg
SAR(1 g) = 13.6 mW/g; SAR(10 g) = 6.35 mW/g
Maximum value of SAR (measured) = 15.4 mW/g



0 dB = 15.4mW/g

Appendix B. SAR Test plots:

#1

Date: 6/1/2015

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

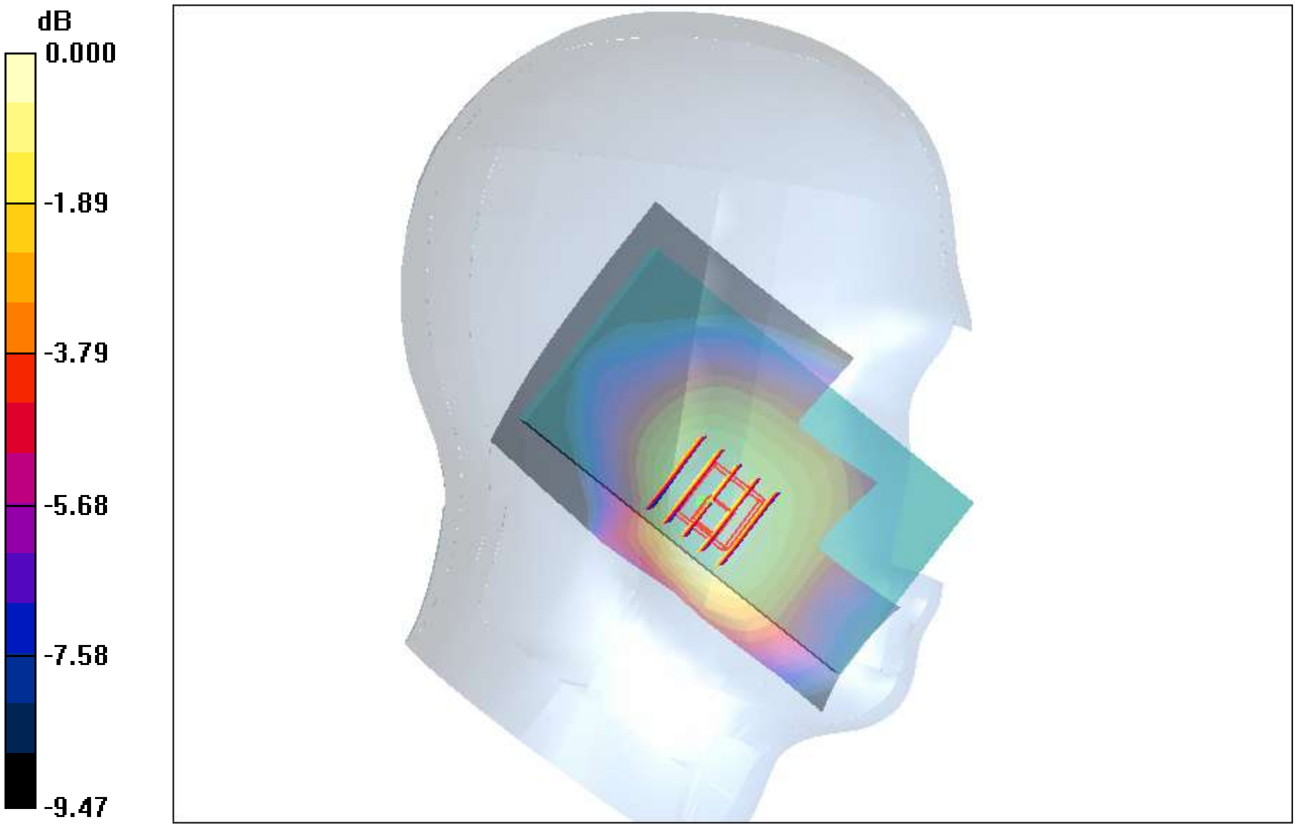
DUT: S915; Type: SI PIN; Serial: IMEI Number
Program Name: s915

Communication System: GSM 850; Frequency: 836.4 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 836.41 MHz; σ = 0.89 mho/m; ε_r = 41.5; ρ = 1000 kg/m^3
Phantom section: Left Section

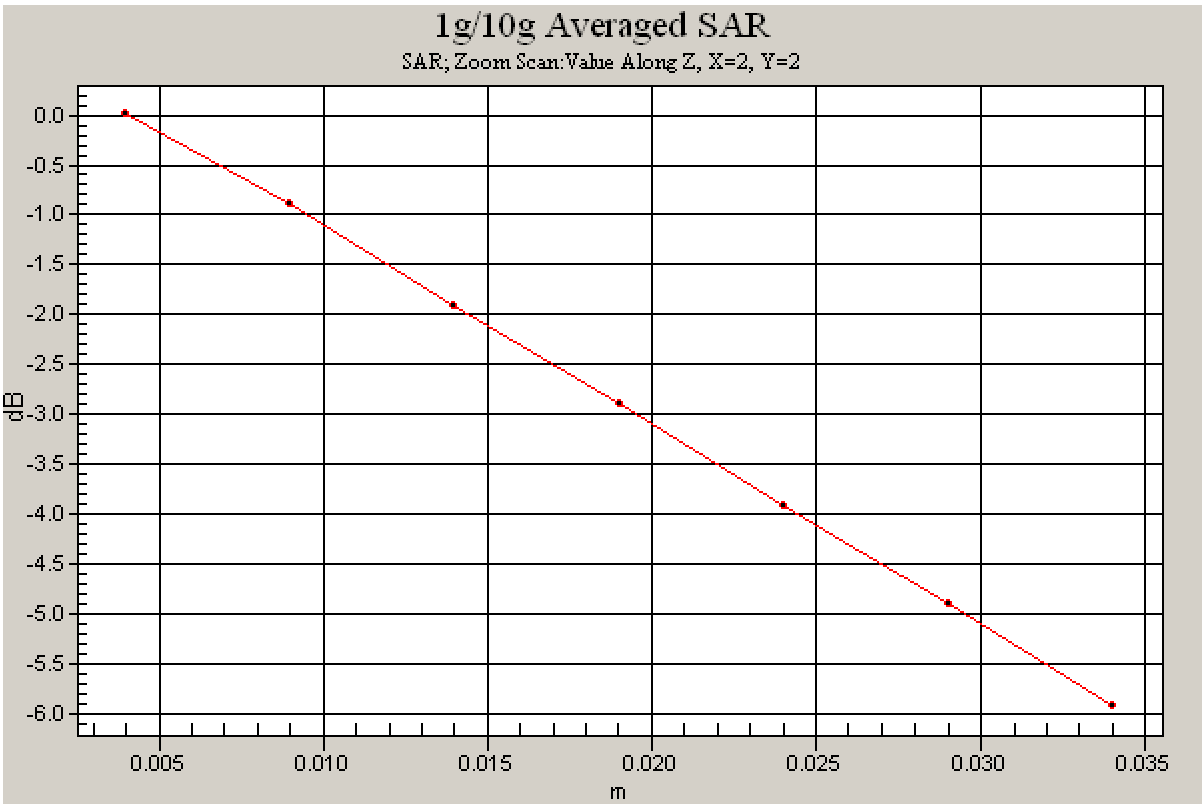
DASY4 Configuration:
- Probe: ES3DV3 - SN3028; ConvF(6.19, 6.19, 6.19); Calibrated: 10/22/2014
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 10/1/2014
- Phantom: SAM 2; Type: SAM; Serial: TP-1432
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

left Cheek/Area Scan (71x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.278 mW/g

left Cheek/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.74 V/m; Power Drift = -0.113 dB
Peak SAR (extrapolated) = 0.334 W/kg
SAR(1 g) = 0.265 mW/g; SAR(10 g) = 0.201 mW/g
Maximum value of SAR (measured) = 0.273 mW/g


dB
0.000
-1.89
-3.79
-5.68
-7.58
-9.47

0 dB = 0.273mW/g


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=2, Y=2
dB
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
-5.5
-6.0
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

#2

Date: 6/13/2015

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

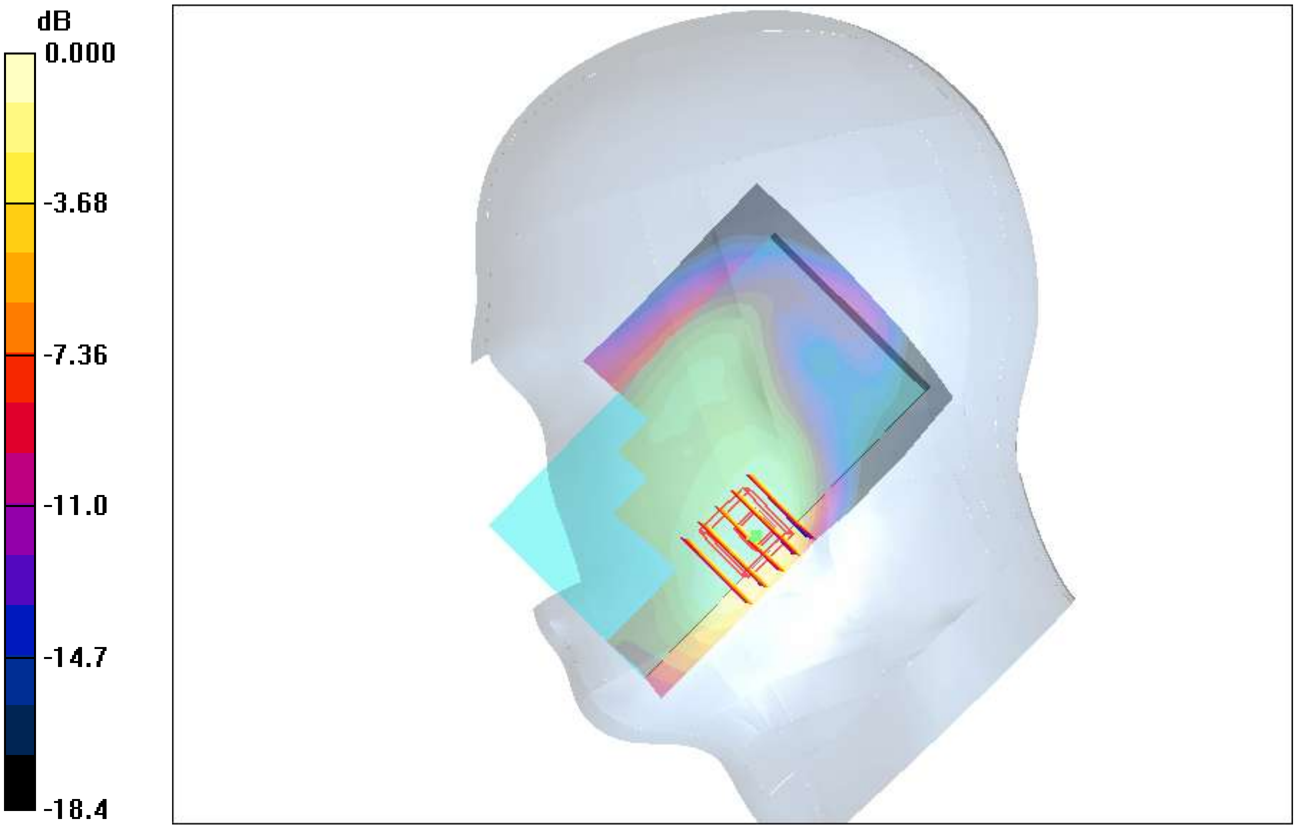
DUT: S915; Type: SI PIN; Serial: IMEI Number
Program Name: s915

Communication System: GSM 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1850.2 MHz; σ = 1.42 mho/m; ε_r = 39.9; ρ = 1000 kg/m^3
Phantom section: Right Section

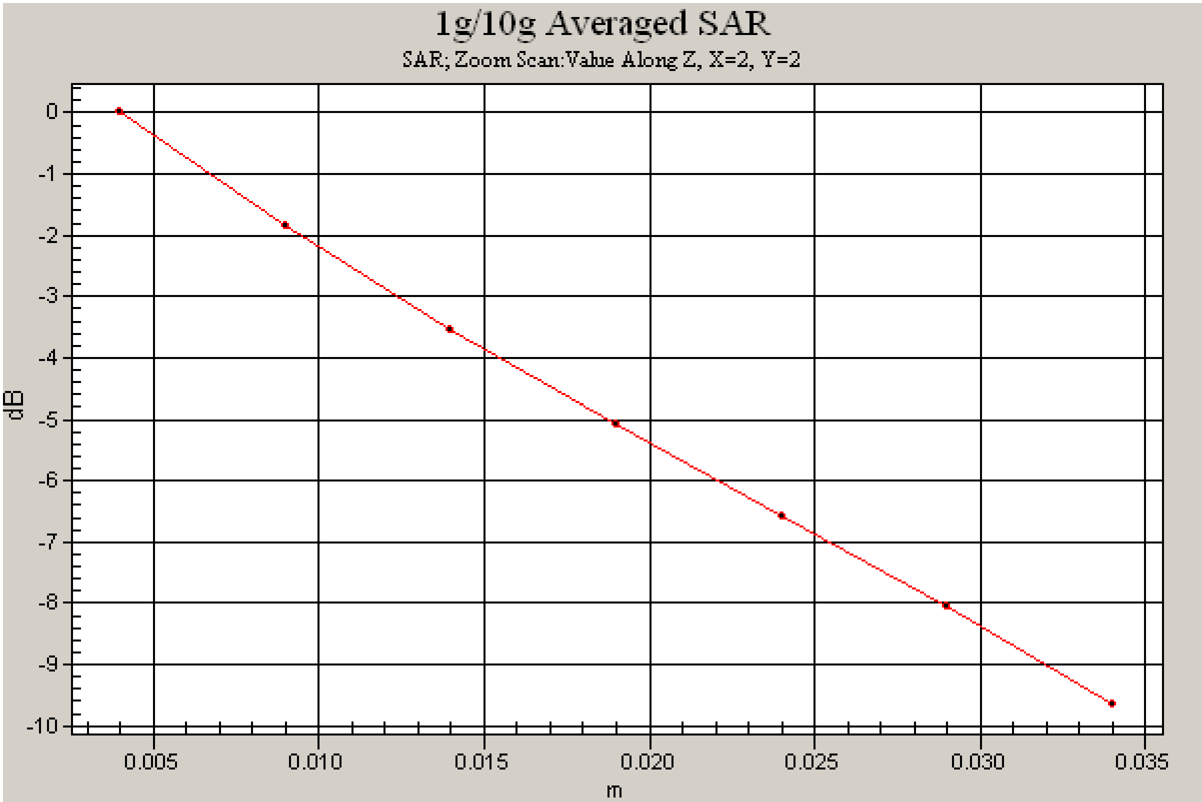
DASY4 Configuration:
- Probe: ES3DV3 - SN3028; ConvF(4.68, 4.68, 4.68); Calibrated: 10/22/2014
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 10/1/2014
- Phantom: SAM 1; Type: SAM; Serial: TP-1360
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

right Cheek/Area Scan (71x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.301 mW/g

right Cheek/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.44 V/m; Power Drift = 0.044 dB
Peak SAR (extrapolated) = 0.411 W/kg
SAR(1 g) = 0.262 mW/g; SAR(10 g) = 0.166 mW/g
Maximum value of SAR (measured) = 0.283 mW/g


dB
0.000
-3.68
-7.36
-11.0
-14.7
-18.4

0 dB = 0.283mW/g


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=2, Y=2
dB
m
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0.005
0.010
0.015
0.020
0.025
0.030
0.035

#3

Date: 6/1/2015

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

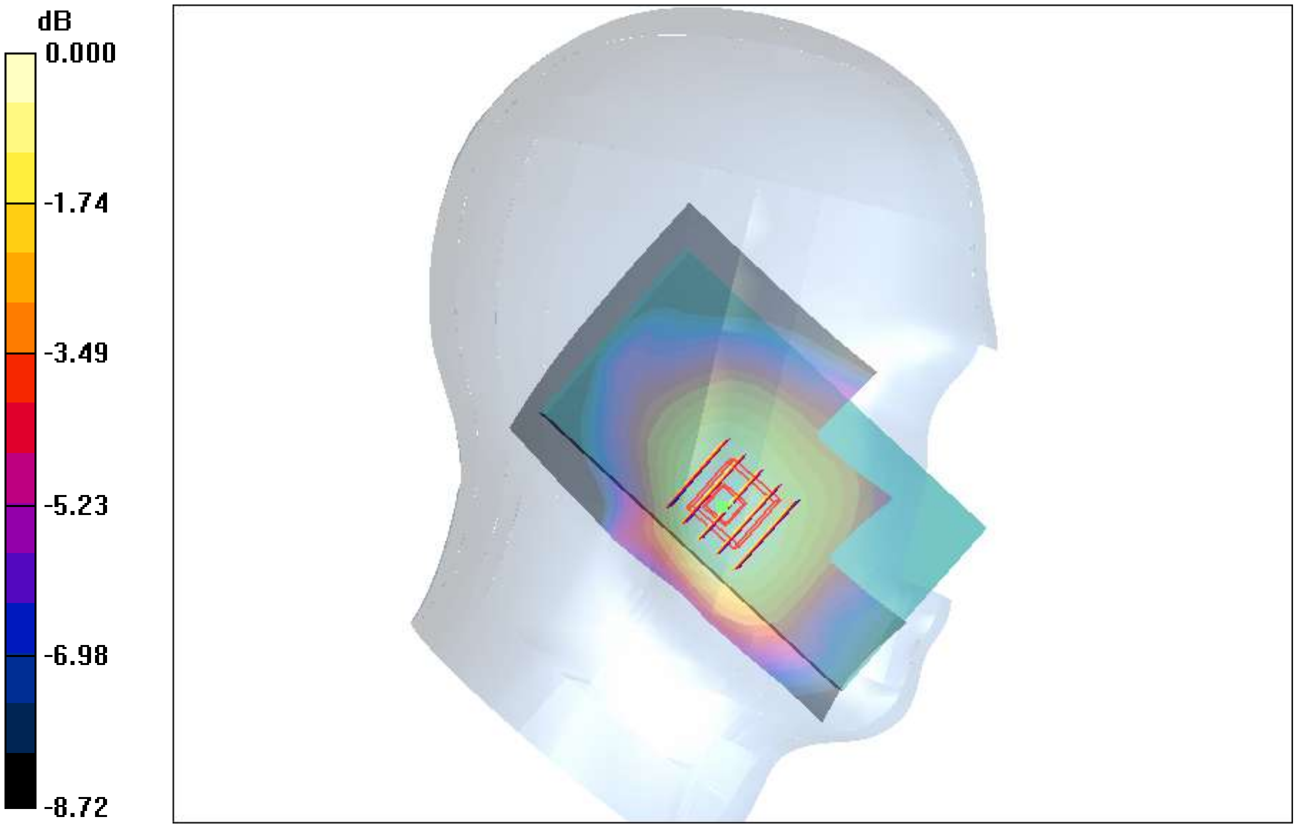
DUT: S915; Type: SI PIN; Serial: IMEI Number
Program Name: s915

Communication System: W850; Frequency: 836.4 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.4 MHz; σ = 0.89 mho/m; ε_r = 41.5; ρ = 1000 kg/m^3
Phantom section: Left Section

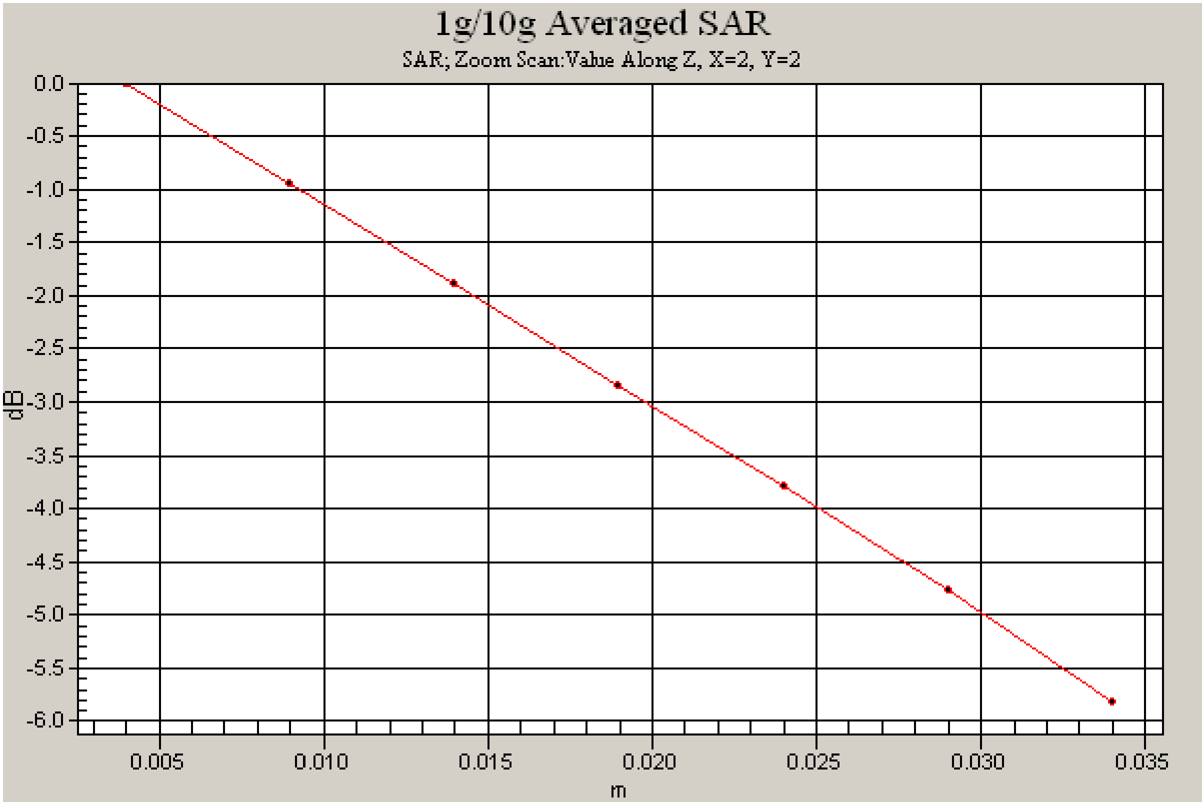
DASY4 Configuration:
- Probe: ES3DV3 - SN3028; ConvF(6.19, 6.19, 6.19); Calibrated: 10/22/2014
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 10/1/2014
- Phantom: SAM 2; Type: SAM; Serial: TP-1432
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

left Cheek/Area Scan (71x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.260 mW/g

left Cheek/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.57 V/m; Power Drift = 0.130 dB
Peak SAR (extrapolated) = 0.307 W/kg
SAR(1 g) = 0.248 mW/g; SAR(10 g) = 0.191 mW/g
Maximum value of SAR (measured) = 0.260 mW/g


dB
0.000
-1.74
-3.49
-5.23
-6.98
-8.72

0 dB = 0.260mW/g


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=2, Y=2
dB
m
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
-5.5
-6.0
0.005
0.010
0.015
0.020
0.025
0.030
0.035

#4

Date: 6/13/2015

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

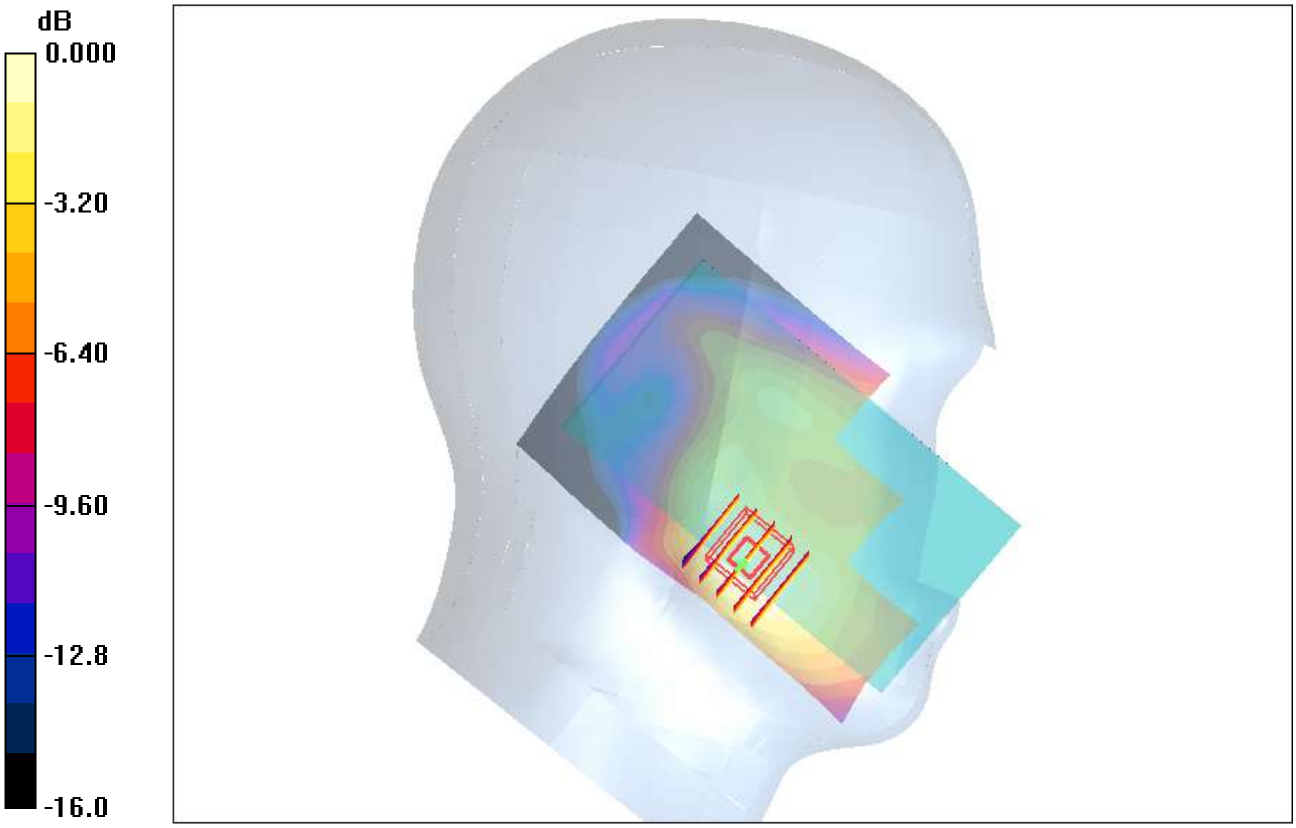
DUT: S915; Type: SI PIN; Serial: IMEI Number
Program Name: s915

Communication System: W1900; Frequency: 1852.4 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1852.4 MHz; σ = 1.42 mho/m; ε_r = 39.9; ρ = 1000 kg/m^3
Phantom section: Left Section

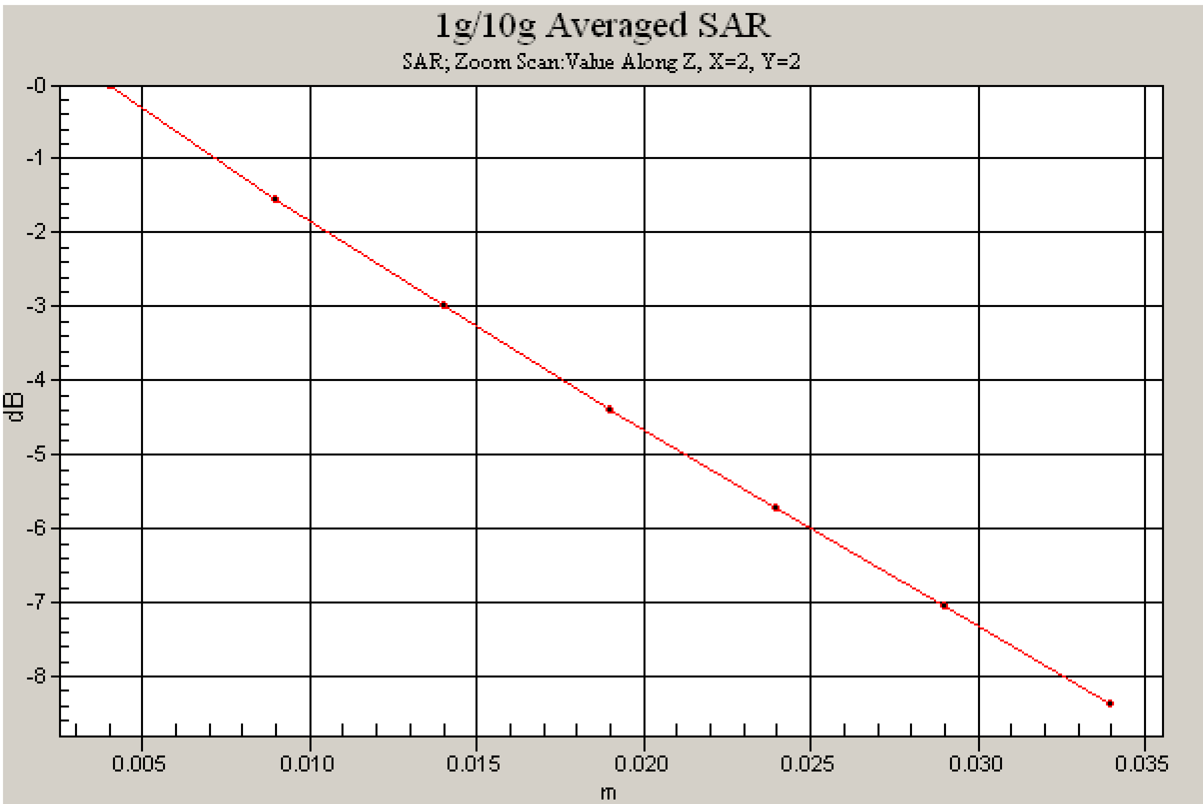
DASY4 Configuration:
- Probe: ES3DV3 - SN3028; ConvF(4.68, 4.68, 4.68); Calibrated: 10/22/2014
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 10/1/2014
- Phantom: SAM 1; Type: SAM; Serial: TP-1360
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

left Cheek/Area Scan (71x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.408 mW/g

left Cheek/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.27 V/m; Power Drift = 0.192 dB
Peak SAR (extrapolated) = 0.522 W/kg
SAR(1 g) = 0.360 mW/g; SAR(10 g) = 0.237 mW/g
Maximum value of SAR (measured) = 0.386 mW/g


dB
0.000
-3.20
-6.40
-9.60
-12.8
-16.0

0 dB = 0.386mW/g


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=2, Y=2
dB
-0
-1
-2
-3
-4
-5
-6
-7
-8
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

#5

Date: 6/2/2015

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

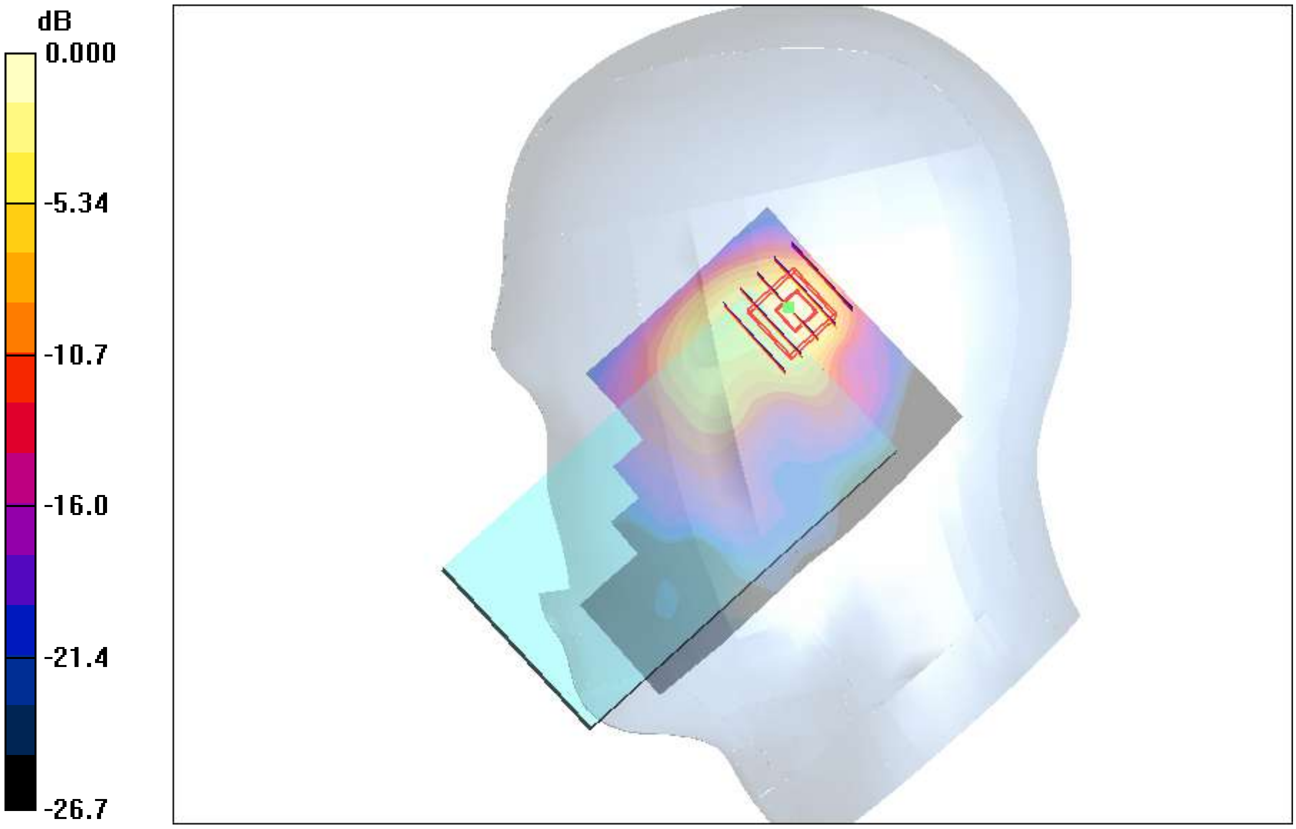
DUT: S915; Type: SI PIN; Serial: IMEI Number
Program Name: s915

Communication System: 802.11; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.82 mho/m; ε_r = 37.5; ρ = 1000 kg/m^3
Phantom section: Right Section

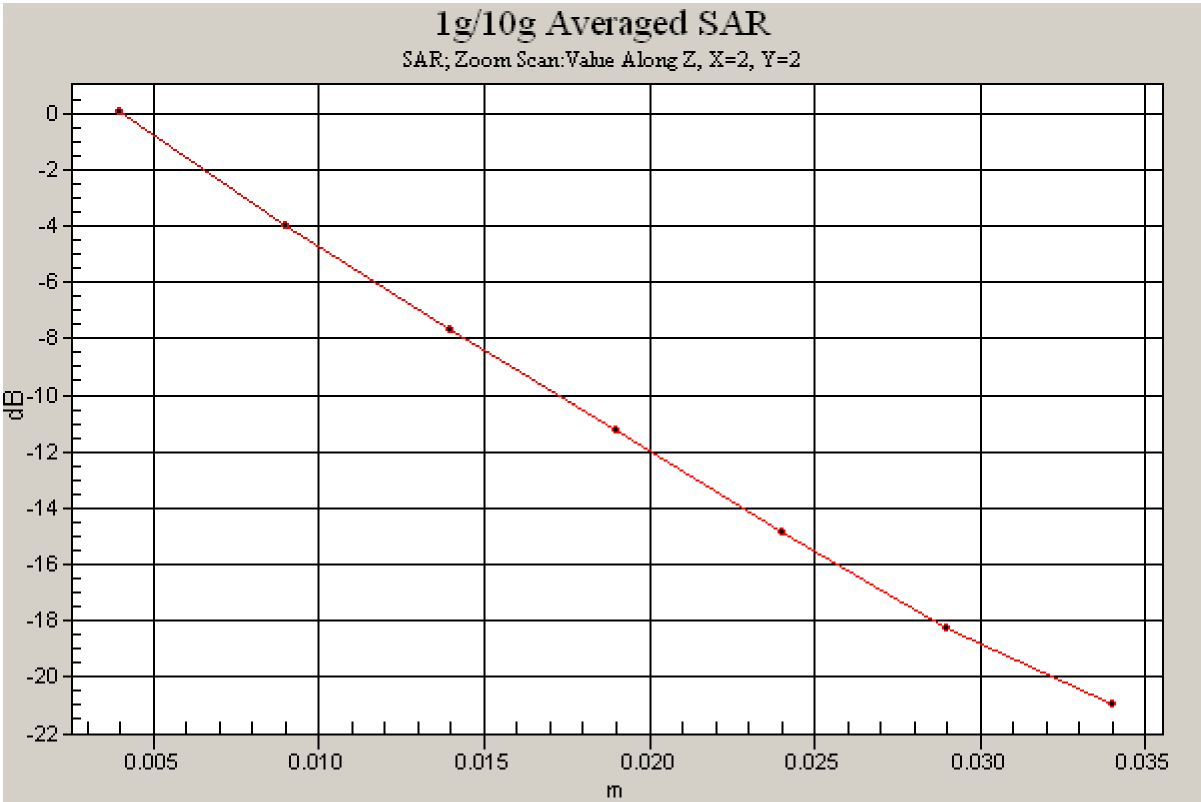
DASY4 Configuration:
- Probe: ES3DV3 - SN3028; ConvF(4.21, 4.21, 4.21); Calibrated: 10/22/2014
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 10/1/2014
- Phantom: SAM 1; Type: SAM; Serial: TP-1360
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Right Cheek/Area Scan (71x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.418 mW/g

Right Cheek/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.41 V/m; Power Drift = -0.052 dB
Peak SAR (extrapolated) = 1.06 W/kg
SAR(1 g) = 0.379 mW/g; SAR(10 g) = 0.146 mW/g
Maximum value of SAR (measured) = 0.408 mW/g


dB
0.000
-5.34
-10.7
-16.0
-21.4
-26.7

0 dB = 0.408mW/g


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=2, Y=2
dB
m
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
0.005
0.010
0.015
0.020
0.025
0.030
0.035

#6

Date: 6/2/2015

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

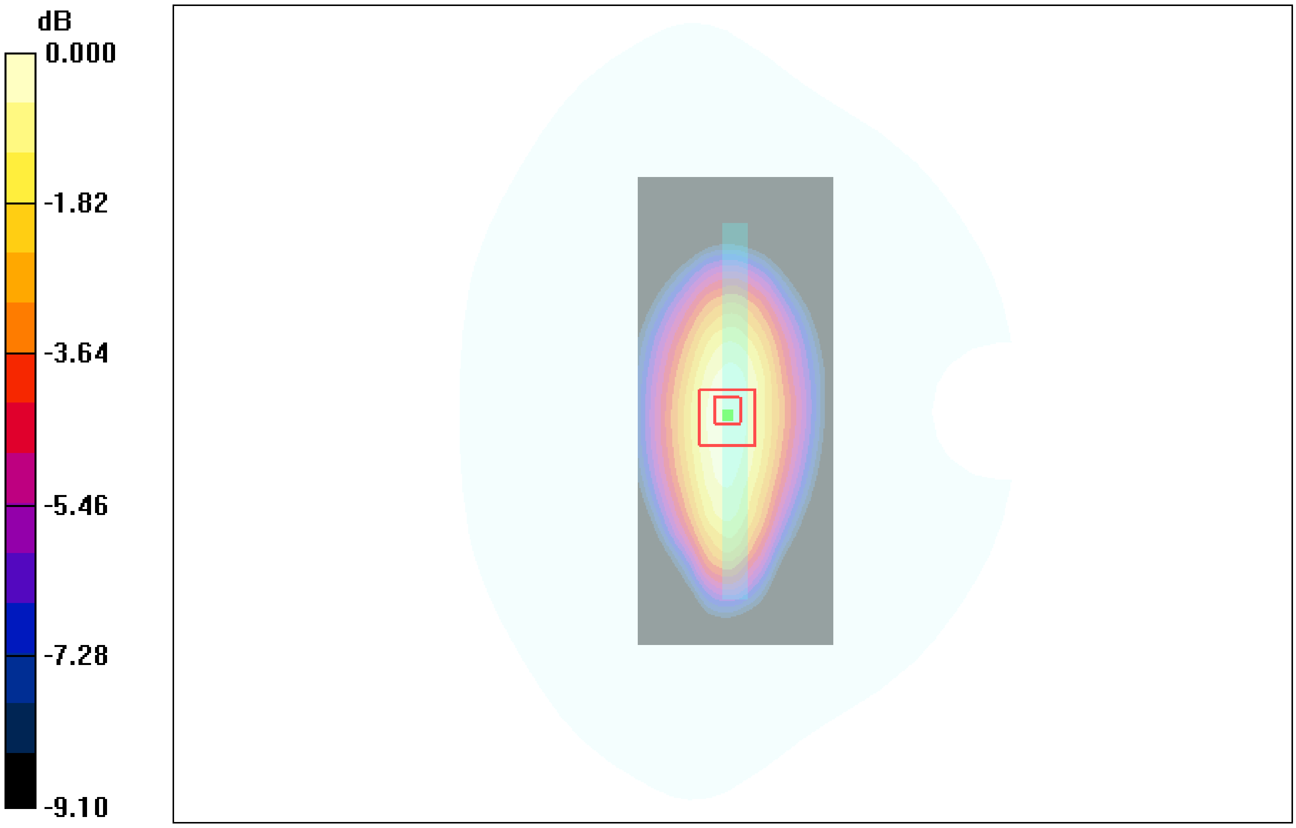
DUT: S915; Type: SI PIN; Serial: IMEI Number
Program Name: s915

Communication System: GPRS850; Frequency: 848.8 MHz;Duty Cycle: 1:2
Medium parameters used: f = 849 MHz; σ = 1.02 mho/m; ε_r = 57.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

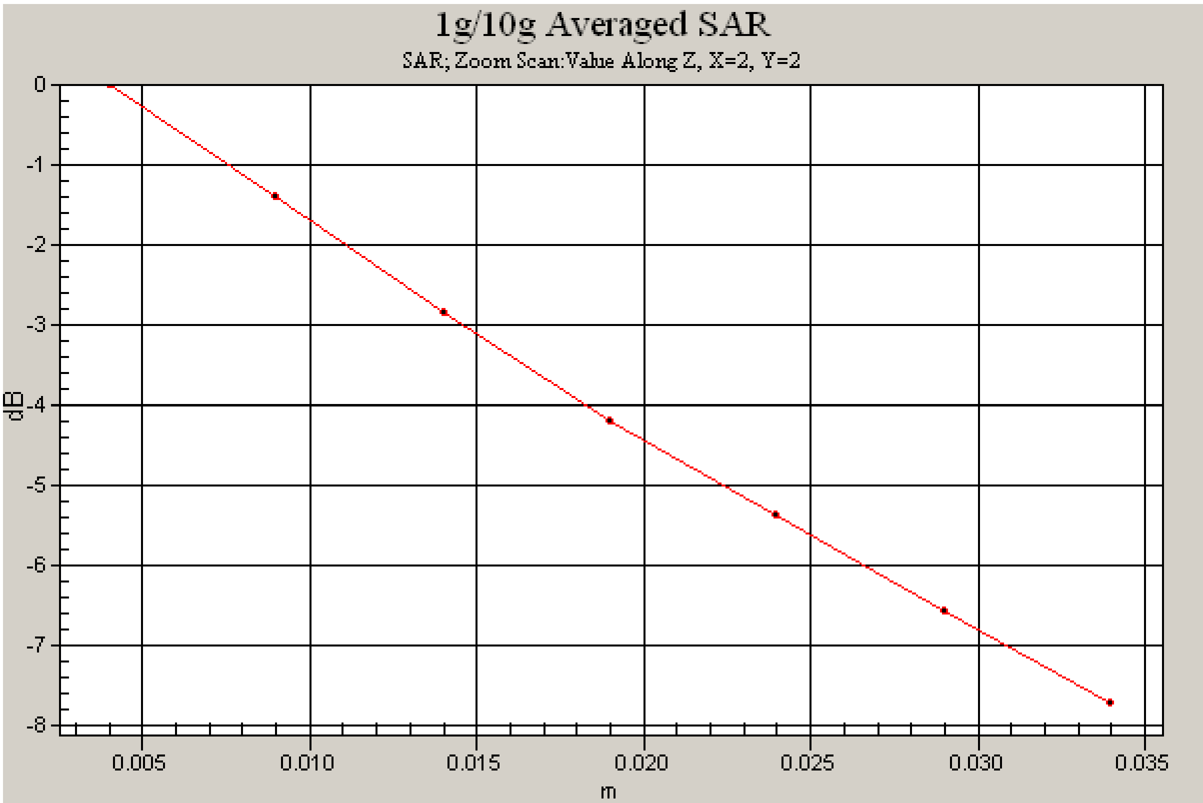
DASY4 Configuration:
- Probe: ES3DV3 - SN3028; ConvF(6.02, 6.02, 6.02); Calibrated: 10/22/2014
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 10/1/2014
- Phantom: SAM 2; Type: SAM; Serial: TP-1432
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Left Side/Area Scan (51x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.663 mW/g

Left Side/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.1 V/m; Power Drift = 0.110 dB
Peak SAR (extrapolated) = 0.841 W/kg
SAR(1 g) = 0.609 mW/g; SAR(10 g) = 0.424 mW/g
Maximum value of SAR (measured) = 0.669 mW/g


dB
0.000
-1.82
-3.64
-5.46
-7.28
-9.10

0 dB = 0.669mW/g


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=2, Y=2
dB
0
-1
-2
-3
-4
-5
-6
-7
-8
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

#7

Date: 6/12/2015

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

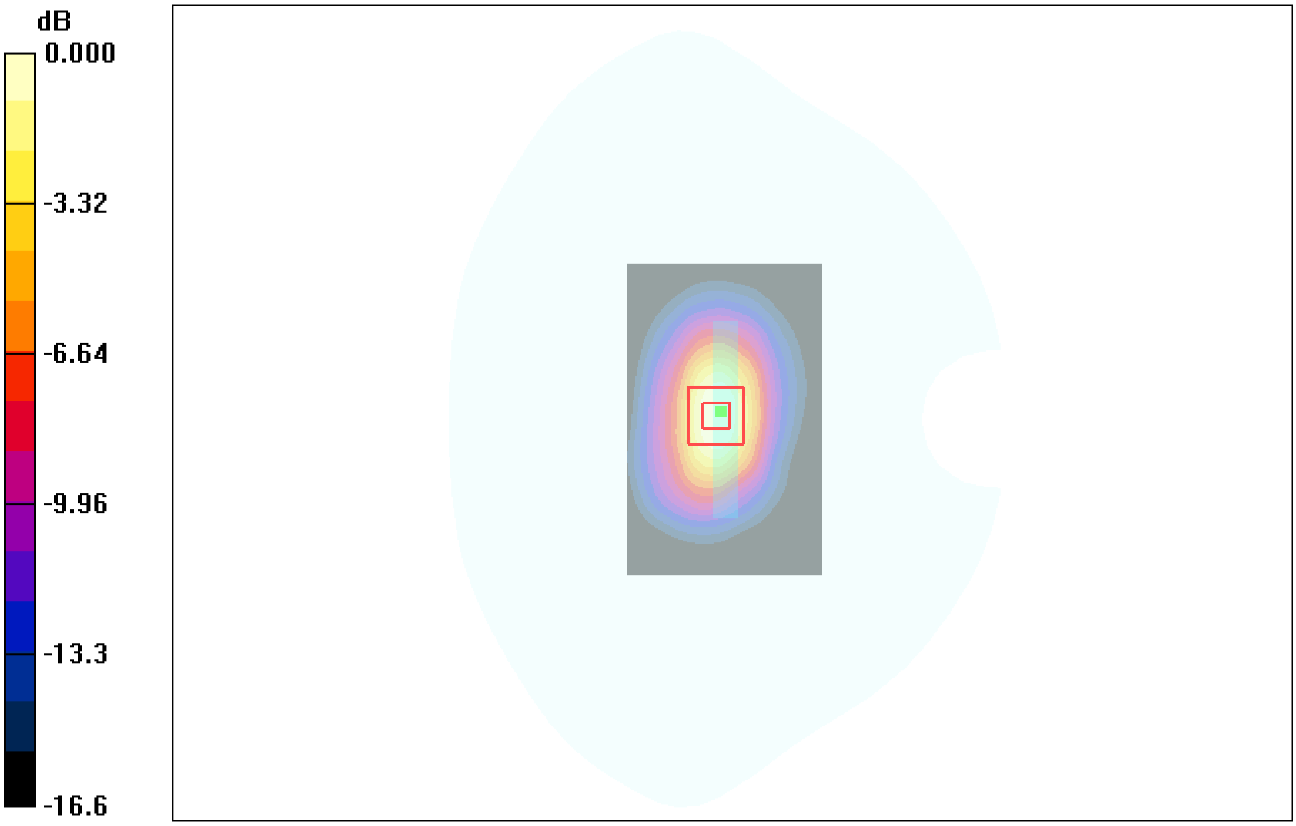
DUT: S915; Type: SI PIN; Serial: IMEI Number
Program Name: s915

Communication System: GPRS1900; Frequency: 1850.2 MHz;Duty Cycle: 1:2
Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.48 mho/m; ε_r = 52.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

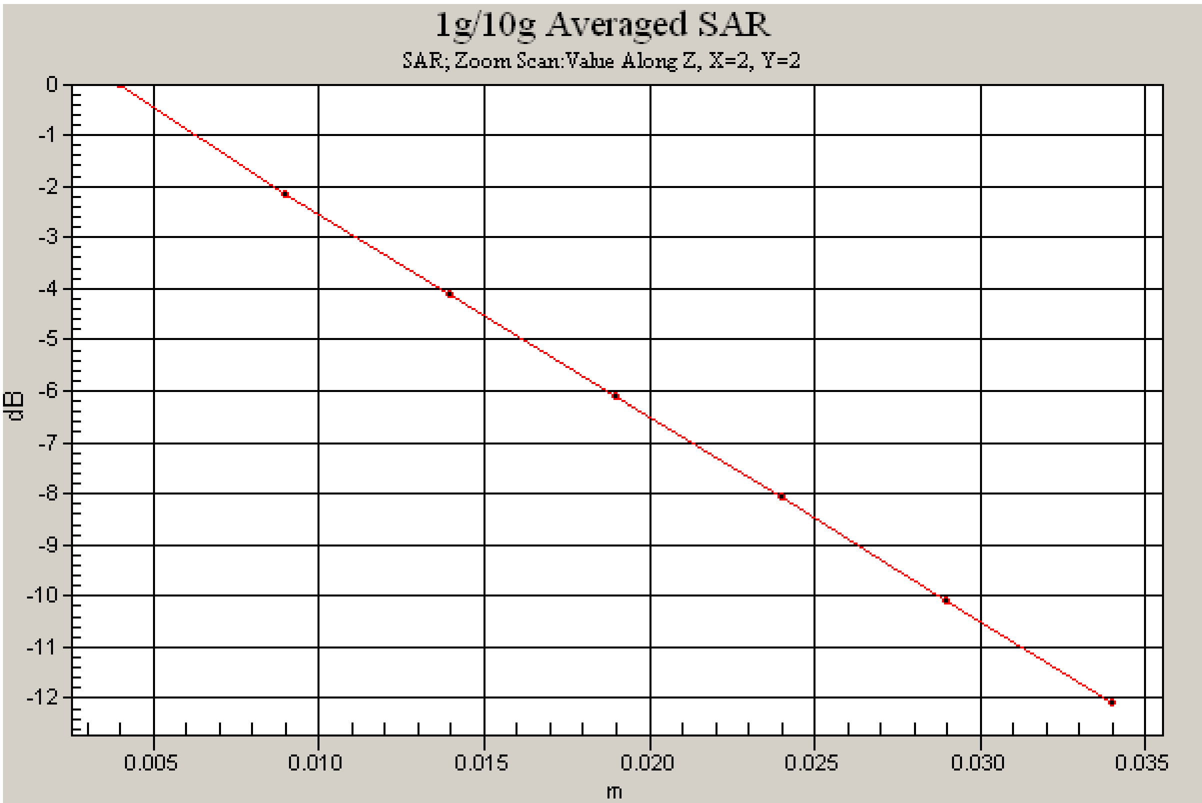
DASY4 Configuration:
- Probe: ES3DV3 - SN3028; ConvF(4.48, 4.48, 4.48); Calibrated: 10/22/2014
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 10/1/2014
- Phantom: SAM 1; Type: SAM; Serial: TP-1360
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Bottom 3/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.823 mW/g

Bottom 3/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.4 V/m; Power Drift = 0.144 dB
Peak SAR (extrapolated) = 1.13 W/kg
SAR(1 g) = 0.657 mW/g; SAR(10 g) = 0.351 mW/g
Maximum value of SAR (measured) = 0.726 mW/g


dB
0.000
-3.32
-6.64
-9.96
-13.3
-16.6

0 dB = 0.726mW/g


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=2, Y=2
dB
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

#8

Date: 6/2/2015

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

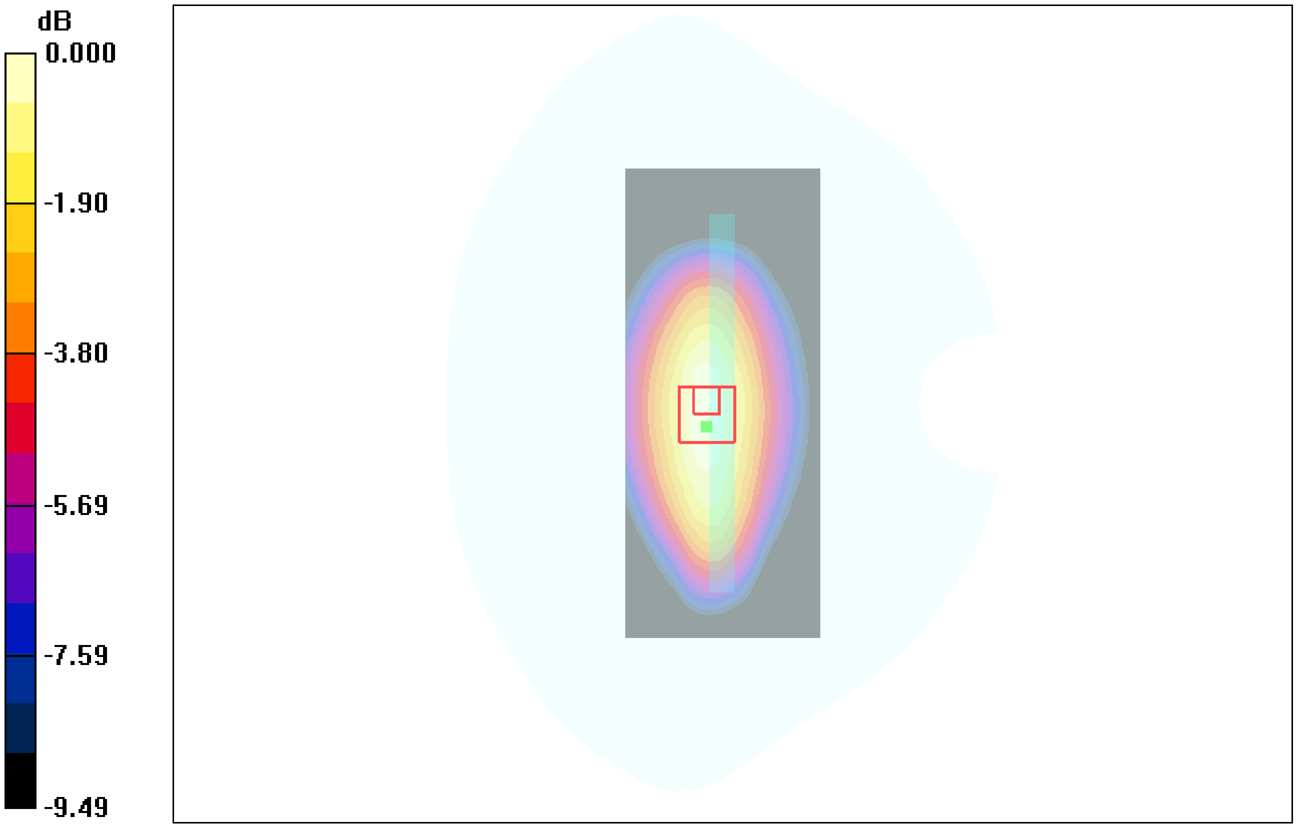
DUT: S915; Type: SI PIN; Serial: IMEI Number
Program Name: s915

Communication System: W850; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.89 mho/m; ε_r = 41.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

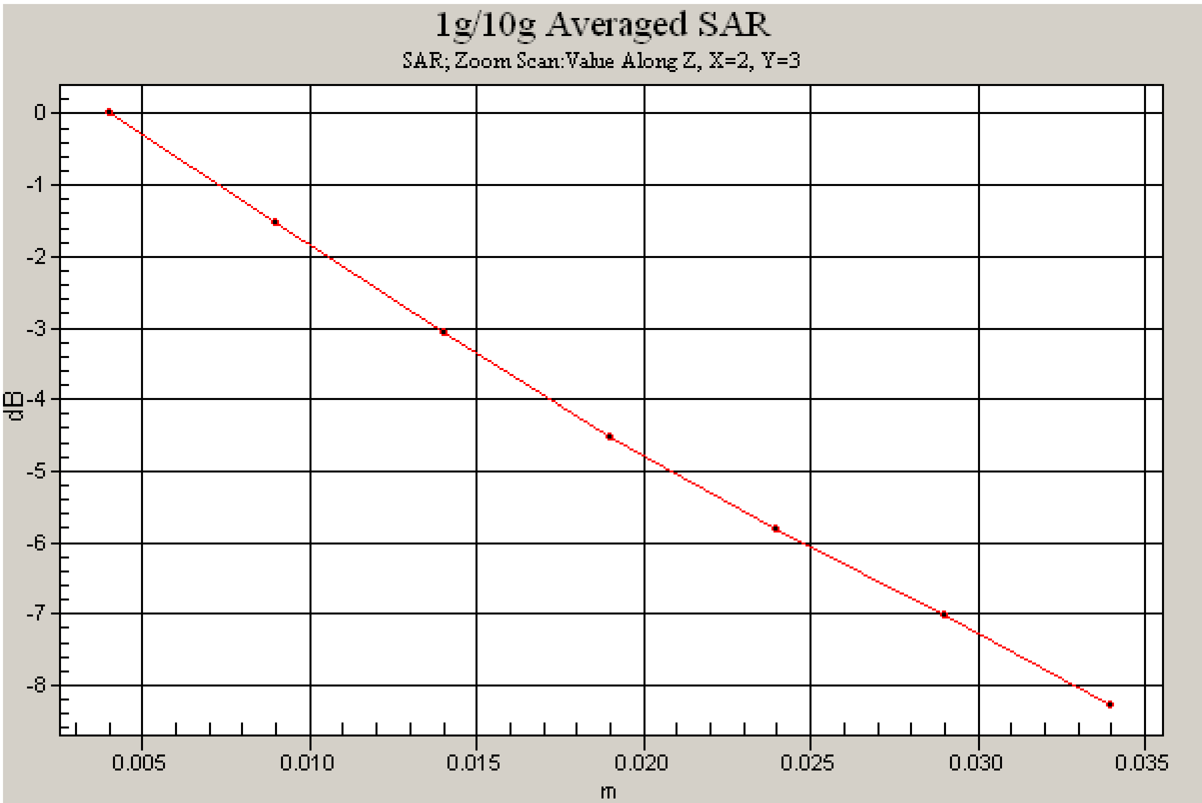
DASY4 Configuration:
- Probe: ES3DV3 - SN3028; ConvF(6.19, 6.19, 6.19); Calibrated: 10/22/2014
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 10/1/2014
- Phantom: SAM 2; Type: SAM; Serial: TP-1432
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

left side/Area Scan (51x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.312 mW/g

left side/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.0 V/m; Power Drift = -0.062 dB
Peak SAR (extrapolated) = 0.426 W/kg
SAR(1 g) = 0.295 mW/g; SAR(10 g) = 0.199 mW/g
Maximum value of SAR (measured) = 0.326 mW/g


dB
0.000
-1.90
-3.80
-5.69
-7.59
-9.49

0 dB = 0.326mW/g


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=2, Y=3
dB
m
0
-1
-2
-3
-4
-5
-6
-7
-8
0.005
0.010
0.015
0.020
0.025
0.030
0.035

#9

Date: 6/12/2015

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

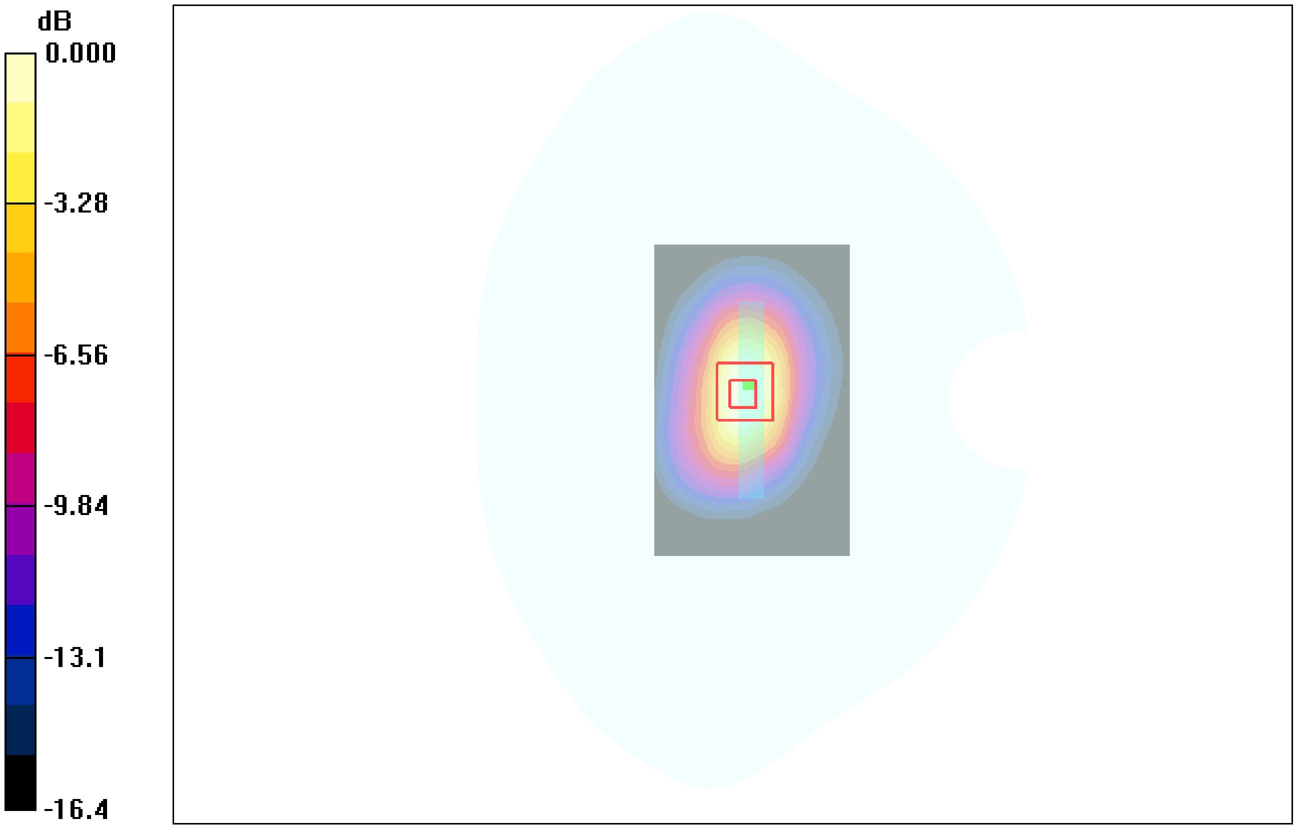
DUT: S915; Type: SI PIN; Serial: IMEI Number
Program Name: s915

Communication System: W1900; Frequency: 1852.4 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1852.4 MHz; σ = 1.48 mho/m; ε_r = 52.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

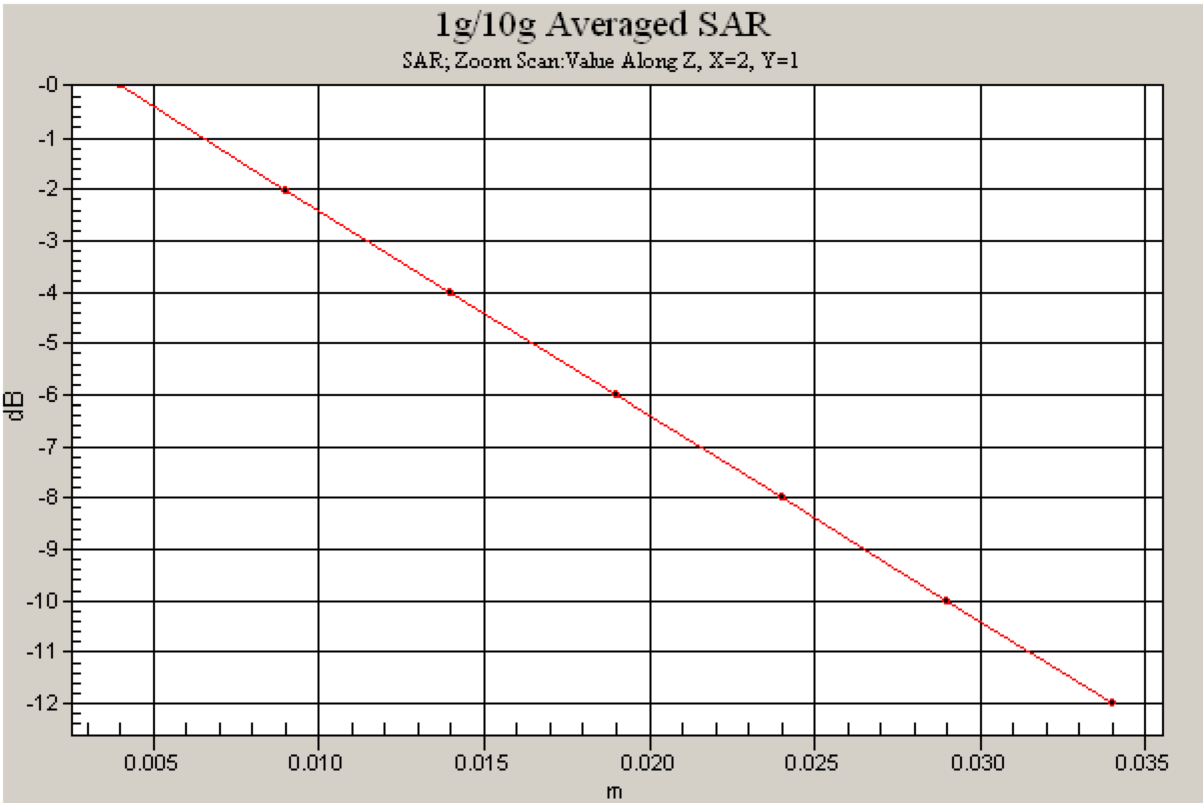
DASY4 Configuration:
- Probe: ES3DV3 - SN3028; ConvF(4.48, 4.48, 4.48); Calibrated: 10/22/2014
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 10/1/2014
- Phantom: SAM 1; Type: SAM; Serial: TP-1360
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Bottom/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.45 mW/g

Bottom/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.0 V/m; Power Drift = -0.159 dB
Peak SAR (extrapolated) = 1.86 W/kg
SAR(1 g) = 1.01 mW/g; SAR(10 g) = 0.603 mW/g
Maximum value of SAR (measured) = 1.22 mW/g


dB
0.000
-3.28
-6.56
-9.84
-13.1
-16.4

0 dB = 1.22mW/g


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=2, Y=1
dB
-0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

#10

Date: 6/2/2015

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

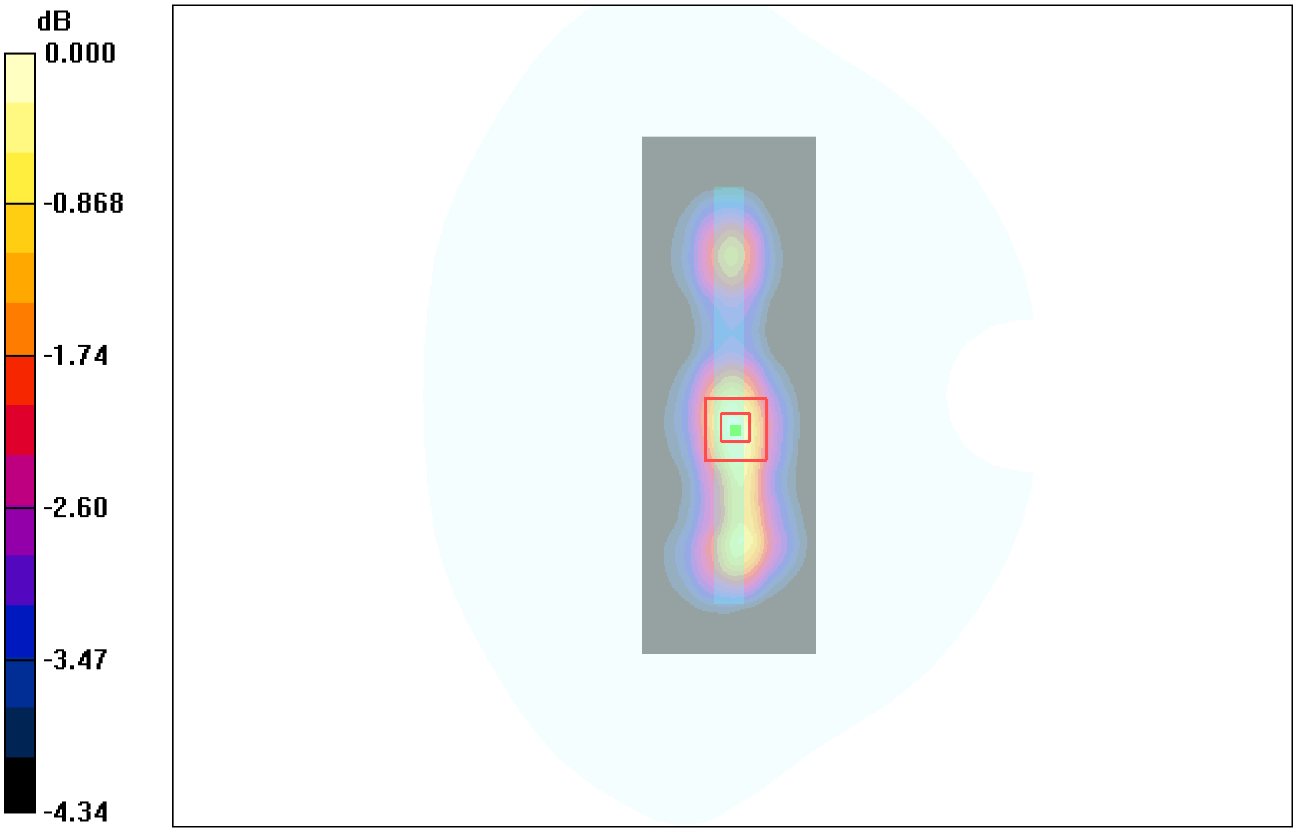
DUT: S915; Type: SI PIN; Serial: IMEI Number
Program Name: s915

Communication System: 802.11; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2462 MHz; σ = 2.05 mho/m; ε_r = 50.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

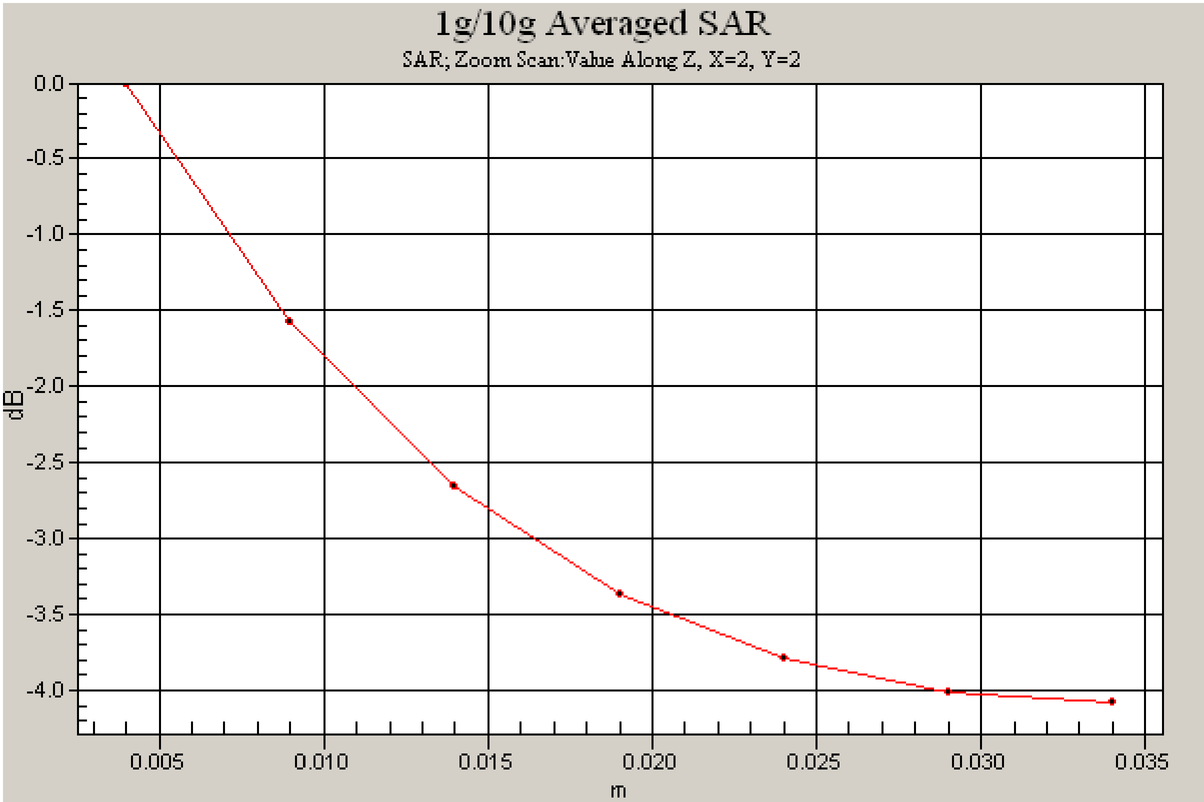
DASY4 Configuration:
- Probe: ES3DV3 - SN3028; ConvF(4.14, 4.14, 4.14); Calibrated: 10/22/2014
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 10/1/2014
- Phantom: SAM 1; Type: SAM; Serial: TP-1360
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Left side /Area Scan (51x151x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.203 mW/g

Left side /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.06 V/m; Power Drift = 0.057 dB
Peak SAR (extrapolated) = 0.341 W/kg
SAR(1 g) = 0.200 mW/g; SAR(10 g) = 0.137 mW/g
Maximum value of SAR (measured) = 0.209 mW/g


dB
0.000
-0.868
-1.74
-2.60
-3.47
-4.34

0 dB = 0.209mW/g


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=2, Y=2
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
dB
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Appendix C. Probe Calibration Data:

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CALIBRATION LABORATORY

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CALIBRATION No. L0570

Client AUDEN Certificate No: Z14-97115

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3028
Calibration Procedure(s)	TMC-OS-E-02-195 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	October 22, 2014

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	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101547	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101548	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Reference10dBAttenuator	BT0520	12-Dec-12(TMC,No.JZ12-867)	Dec-14
Reference20dBAttenuator	BT0267	12-Dec-12(TMC,No.JZ12-866)	Dec-14
Reference Probe EX3DV4	SN 3617	28-Aug-14(SPEAG,No.EX3-3617_Aug14)	Aug-15
DAE4	SN 1331	23-Jan-14 (SPEAG, DAE4-1331_Jan14)	Jan -15
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	01-Jul-14 (CTTL, No.J14X02145)	Jun-15
Network Analyzer E5071C	MY46110673	15-Feb-14 (TMC, No.JZ14-781)	Feb-15

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: October 23, 2014

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Glossary:

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

Calibration is Performed According to the Following Standards:

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

b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005

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).

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Probe ES3DV3

SN: 3028

Calibrated: October 22, 2014

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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DASY – Parameters of Probe: ES3DV3 - SN: 3028

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm($\mu V/(V/m)^2$)[A]	1.16	1.27	1.21	±10.8%
DCP(mV)[B]	105.8	103.2	103.8	

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	282.9	±2.2%
		Y	0.0	0.0	1.0		292.0	
		Z	0.0	0.0	1.0		290.3	

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.

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DASY – Parameters of Probe: ES3DV3 - SN: 3028

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	6.02	6.02	6.02	0.33	1.68	±12%
835	55.2	0.97	6.02	6.02	6.02	0.34	1.79	±12%
1750	53.4	1.49	4.69	4.69	4.69	0.63	1.30	±12%
1900	53.3	1.52	4.48	4.48	4.48	0.60	1.34	±12%
2300	52.9	1.81	4.37	4.37	4.37	0.74	1.25	±12%
2450	52.7	1.95	4.14	4.14	4.14	0.68	1.35	±12%
2600	52.5	2.16	4.02	4.02	4.02	0.84	1.16	±12%

[C] Frequency validity 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.

[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.

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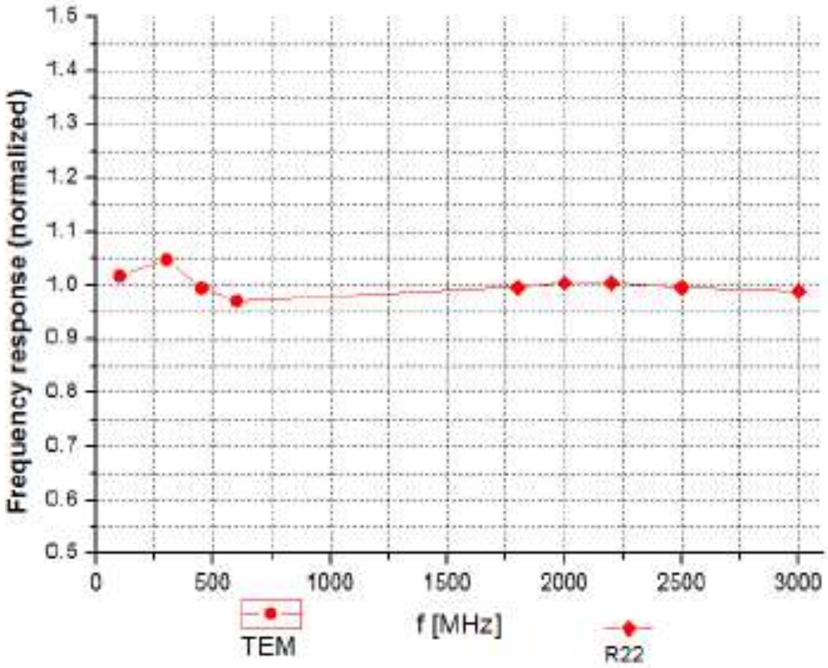
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.5% (k=2)

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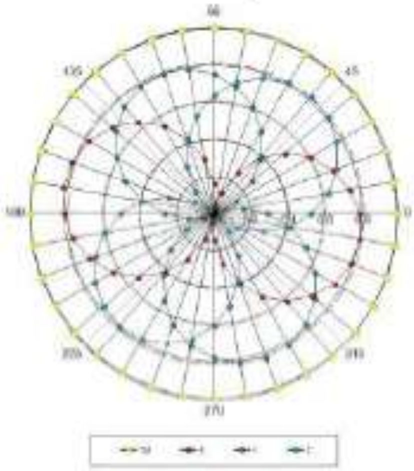
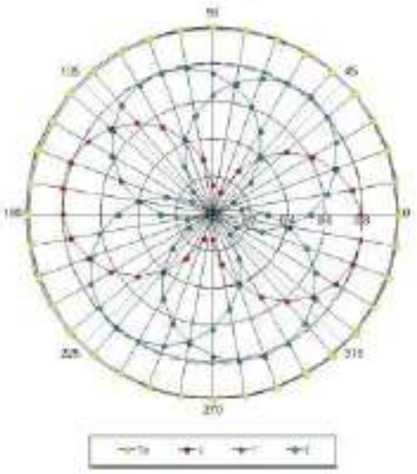
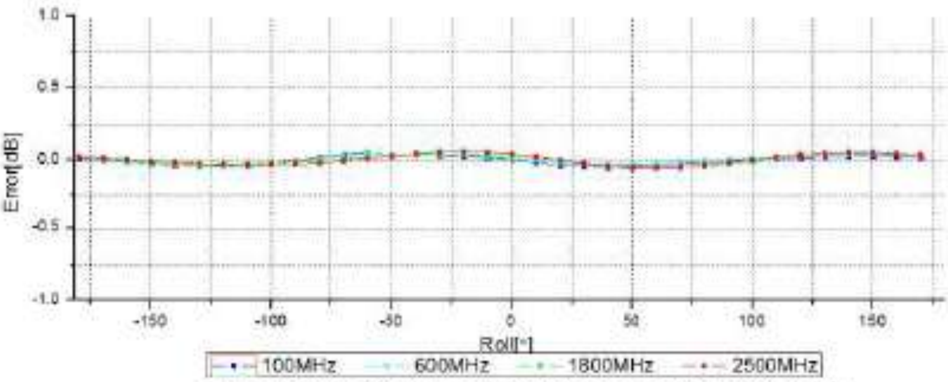
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





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

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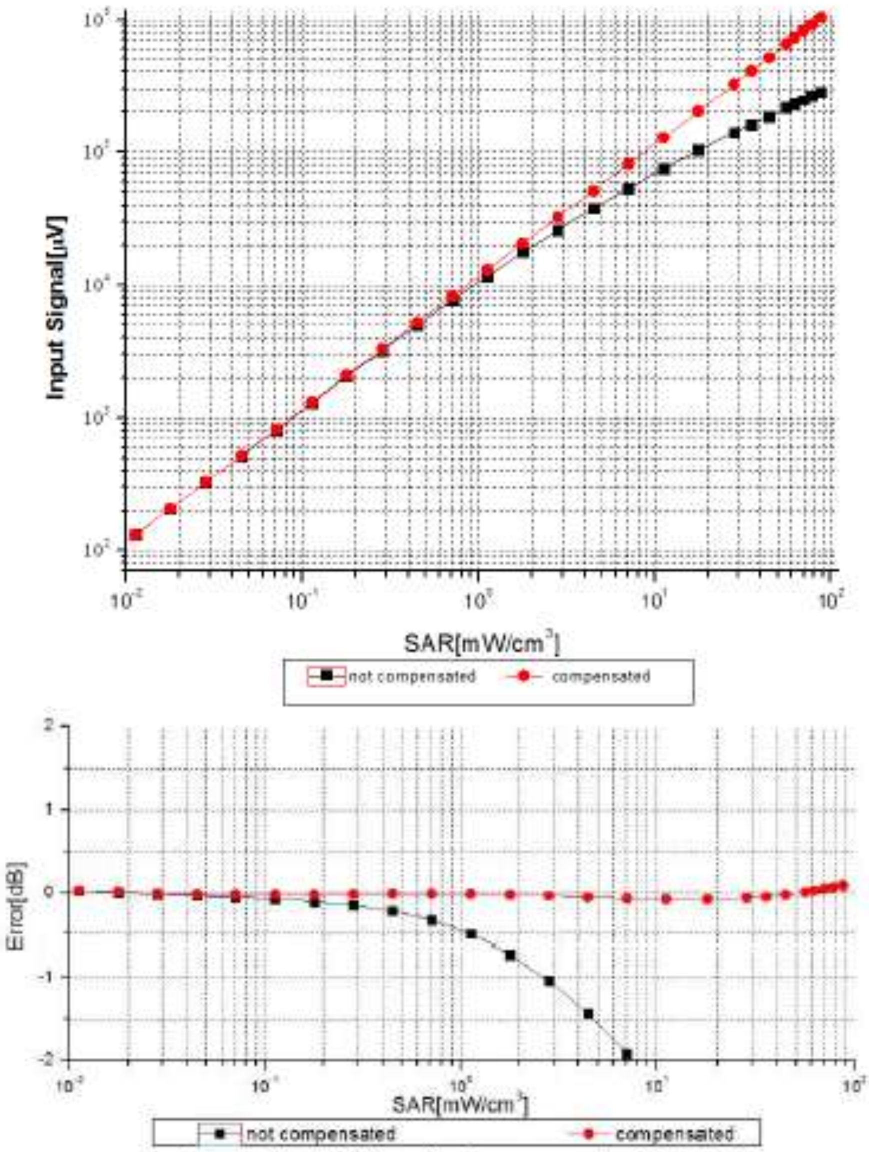
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)



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

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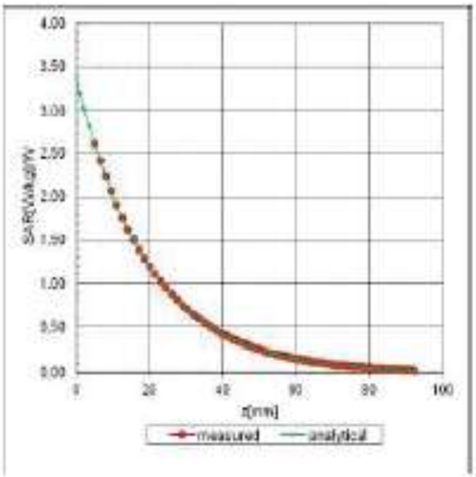
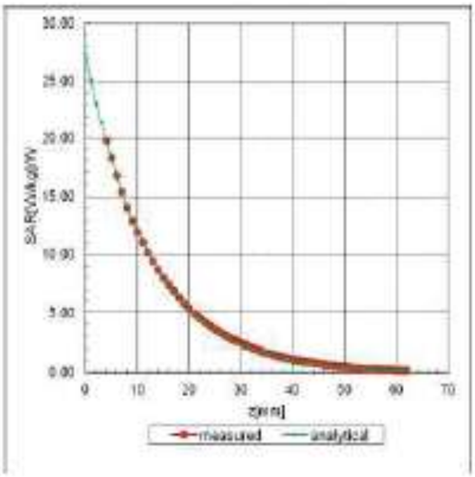
Conversion Factor Assessment

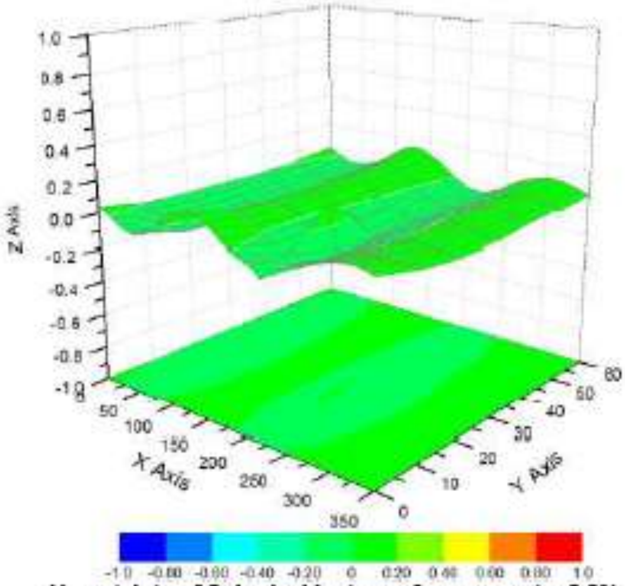
f=835 MHz, WGLS R9(H_convF)



f=1750 MHz, WGLS R22(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±2.8% (K=2)

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DASY - Parameters of Probe: ES3DV3 - SN: 3208

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	54.8
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
Tip Diameter	4mm
Probe Tip to Sensor X Calibration Point	2mm
Probe Tip to Sensor Y Calibration Point	2mm
Probe Tip to Sensor Z Calibration Point	2mm
Recommended Measurement Distance from Surface	3mm

June 26, 2013

Acceptable Conditions for SAR Measurements Using Probes and Dipoles Calibrated under the SPEAG-TMC Dual-Logo Calibration Program to Support FCC Equipment Certification

The acceptable conditions for SAR measurements using probes, dipoles and DAEs calibrated by TMC (*Telecommunication Metrology Center of MITT in Beijing, China*), under the Dual-Logo Calibration Certificate program and quality assurance (QA) protocols established between SPEAG (*Schmid & Partner Engineering AG, Switzerland*) and TMC, to support FCC (*U.S. Federal Communications Commission*) equipment certification are defined and described in the following.

1) The agreement established between SPEAG and TMC is only applicable to calibration services performed by TMC where its clients (companies and divisions of such companies) are headquartered in the Greater China Region, including Taiwan and Hong Kong. This agreement is subject to renewal at the end of each calendar year between SPEAG and TMC. TMC shall inform the FCC of any changes or early termination to the agreement.
2) Only a subset of the calibration services specified in the SPEAG-TMC agreement, while it remains valid, are applicable to SAR measurements performed using such equipment for supporting FCC equipment certification. These are identified in the following.
   a) Calibration of dosimetric (SAR) probes EX3DVx, ET3DVx and ES3DVx.
      i) Free-space E-field and H-field probes, including those used for HAC (hearing aid compatibility) evaluation, temperature probes, other probes or equipment not identified in this document, when calibrated by TMC, are excluded and cannot be used for measurements to support FCC equipment certification.
      ii) Signal specific and bundled probe calibrations based on PMR (probe modulation response) characteristics are handled according to the requirements of KDB 865664; that is, "Until standardized procedures are available to make such determination, the applicability of a signal specific probe calibration for testing specific wireless modes and technologies is determined on a case-by-case basis through KDB inquiries, including SAR system verification requirements."
   b) Calibration of SAR system validation dipoles, excluding HAC dipoles.
   c) Calibration of data acquisition electronics DAE3Vx, DAE4Vx and DAEasyVx.
   d) For FCC equipment certification purposes, the frequency range of SAR probe and dipole calibrations is limited to 700 MHz - 6 GHz and provided it is supported by the equipment identified in the TMC QA protocol (a separate attachment to this document).
   e) The identical system and equipment setup, measurement configurations, hardware, evaluation algorithms, calibration and QA protocols, including the format of calibration certificates and reports used by SPEAG shall be applied by TMC.
   f) The calibrated items are only applicable to SPEAG DASY 4 and DASY 5 or higher version systems.

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

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

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

Accreditation No.: **SCS 108**

Client **Sunway-SZ (Auden)**

Certificate No: **DAE4-689_Oct14**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BM - SN: 689
Calibration procedure(s)	QA CAL-06.v28 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	October 01, 2014

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	01-Oct-13 (No:13976)	Oct-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	07-Jan-14 (in house check)	In house check: Jan-15
Calibrator Box V2.1	SE UMS 006 AA 1002	07-Jan-14 (in house check)	In house check: Jan-15

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	[signature]
Approved by:	Fin Bomholt	Deputy Technical Manager	F. Bomholt

Issued: October 1, 2014

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

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Accreditation No.: **SCS 108**

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.

Appendix D. DAE Calibration Data:

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	404.239 ± 0.02% (k=2)	404.156 ± 0.02% (k=2)	404.835 ± 0.02% (k=2)
Low Range	3.94871 ± 1.50% (k=2)	3.98364 ± 1.50% (k=2)	4.00706 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	83.0 ° ± 1 °

Appendix (Additional assessments outside the scope of SCS108)

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	200037.45	-2.43	-0.00
Channel X	+ Input	20004.97	0.89	0.00
Channel X	- Input	-20004.37	1.76	-0.01
Channel Y	+ Input	200038.83	1.40	0.00
Channel Y	+ Input	20005.93	1.88	0.01
Channel Y	- Input	-20004.16	1.95	-0.01
Channel Z	+ Input	200036.92	-0.75	-0.00
Channel Z	+ Input	20003.46	-0.50	-0.00
Channel Z	- Input	-20002.36	3.79	-0.02

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2000.93	0.43	0.02
Channel X	+ Input	200.65	0.11	0.05
Channel X	- Input	-198.95	0.46	-0.23
Channel Y	+ Input	2000.28	0.04	0.00
Channel Y	+ Input	200.24	-0.14	-0.07
Channel Y	- Input	-199.08	-0.30	0.16
Channel Z	+ Input	2000.87	0.60	0.03
Channel Z	+ Input	199.31	-1.12	-0.56
Channel Z	- Input	-200.09	-0.51	0.25

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	22.24	21.85
	- 200	-19.90	-22.18
Channel Y	200	1.27	-0.05
	- 200	4.06	3.25
Channel Z	200	16.18	15.97
	- 200	-18.12	-18.54

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	-	-1.25	-1.10
Channel Y	200	4.48	-	-0.80
Channel Z	200	7.05	3.04	-

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	15681	16385
Channel Y	16252	16126
Channel Z	16131	16597

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	1.41	0.05	2.73	0.67
Channel Y	0.68	-1.71	2.71	0.60
Channel Z	-0.36	-1.58	0.75	0.48

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

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

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

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

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.8 ± 6 %	1.81 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**53.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.24 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.8 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.9 ± 6 %	2.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.2 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**51.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.0 W/kg ± 16.5 % (k=2)**

Appendix E. Dipole Calibration Data:

TMC In Collaboration with speag CALIBRATION LABORATORY
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ilac-MRA CNAS 校准 CNAS L0442

Client: Sunway | Certificate No: J13-2-2185

CALIBRATION CERTIFICATE

Object: D900V2 - SN: 1d086

Calibration Procedure(s): TMC-OS-E-02-194
Calibration procedure for dipole validation kits

Calibration date: August 9, 2013

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	102083	11-Sep-12 (TMC, No.JZ12-443)	Sep-13
Power sensor NRV-Z5	100595	11-Sep-12 (TMC, No. JZ12-443)	Sep -13
Reference Probe EX3DV4	SN 3846	20- Dec-12 (SPEAG, No.EX3-3846_Dec12)	Dec-13
DAE4	SN 777	22-Feb-13 (SPEAG, DAE4-777_Feb13)	Feb -14
Signal Generator E4438C	MY49070393	13-Nov-12 (TMC, No.JZ12-394)	Nov-13
Network Analyzer E8362B	MY43021135	19-Oct-12 (TMC, No.JZ13-278)	Oct-13

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	赵靖
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Xiao Li	Deputy Director of the laboratory	

Issued: August 11, 2013

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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 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

d) 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%.

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Measurement Conditions

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

DASY Version	DASY52	52.8.7.1137
Extrapolation	Advanced Extrapolation	
Phantom	Twin Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.97 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.6 ± 6 %	0.98 mho/m ± 6 %
Head TSL temperature change during test	<0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.67 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**10.7 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.72 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.87 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.0	1.05 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.2 ± 6 %	1.02 mho/m ± 6 %
Body TSL temperature change during test	<0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.63 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**10.7mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.71 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.94 mW /g ± 20.4 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.1Ω-8.85jΩ
Return Loss	- 22.3dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	42.1Ω+0.52jΩ
Return Loss	- 21.3dB

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

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DASY5 Validation Report for Head TSL Date: 02.08.2013

Test Laboratory: TMC, Beijing, China

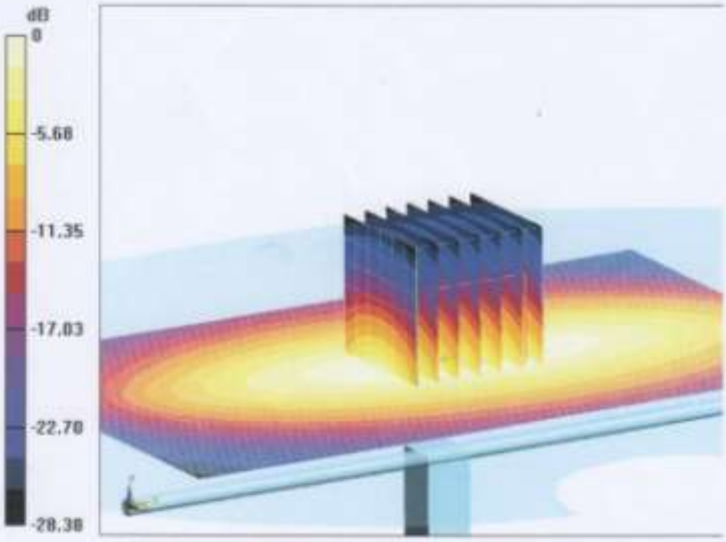
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 1d086

Communication System: CW; Frequency: 900 MHz
Medium parameters used: f = 900 MHz; σ = 0.982 mho/m; εr = 42.66; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(9.01,9.01,9.01); Calibrated:20,12,2012
- Sensor-Surface: 2mm (Mechanical Surface Detection); 1.0, 31.0
- Electronics: DAE4 Sn777; Calibrated: 22/2/2013
- Phantom: Flat Phantom; Type: QD000P40CC;
- DASY52 52.8.7(1137); SEMCAD X Version 14.6.10 (7164)

Dipole Calibration for Head Tissue/Pin=250mW, d=15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.910 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 4.11 W/kg
SAR(1 g) = 2.67 W/kg; SAR(10 g) = 1.72 W/kg
Maximum value of SAR (measured) = 3.43 W/kg



0 dB = 3.44 W/kg = 5.36 dBW/kg

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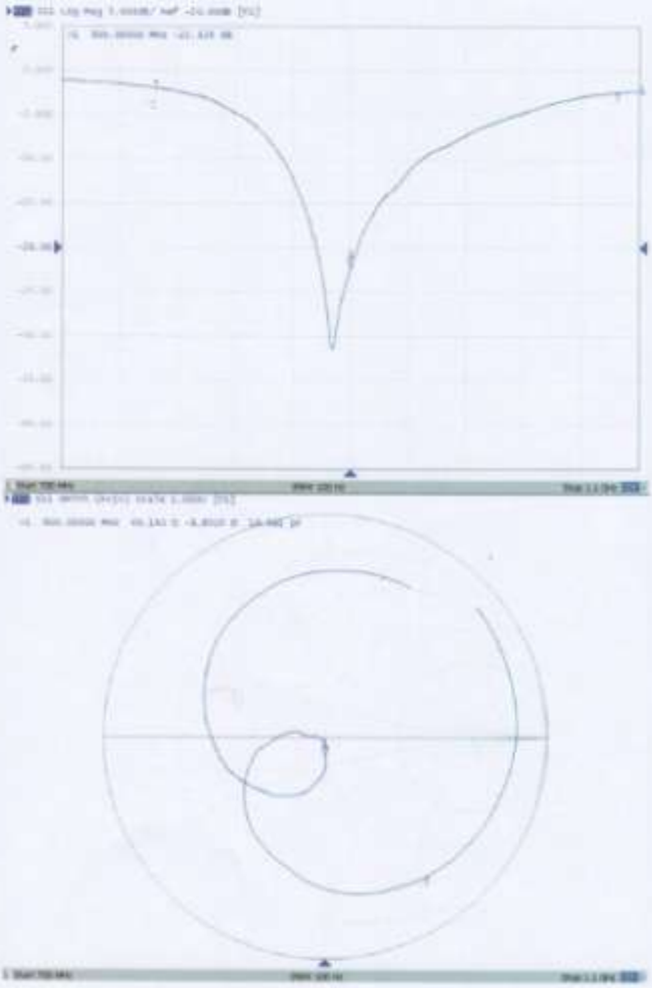
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 02.08.2013

Test Laboratory: TMC, Beijing, China

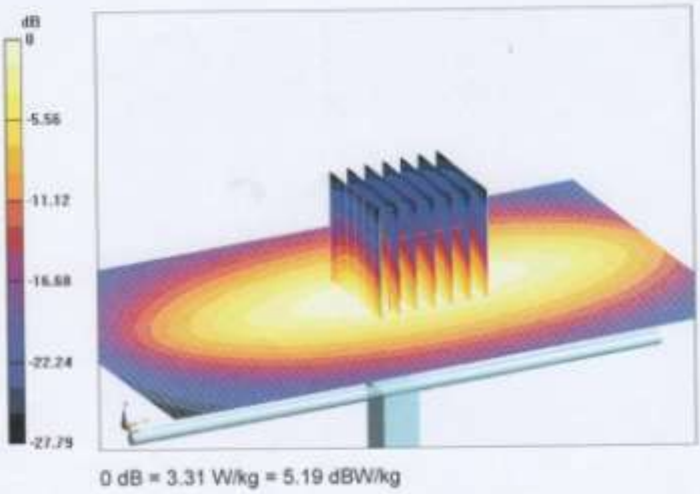
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 1d086

Communication System: CW; Frequency: 900 MHz;
Medium parameters used: f = 900 MHz; σ = 1.023 mho/m; εr = 54.207; ρ = 1000 kg/m^3 .
Phantom section: ELI 4.0
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(9.01,9.01,9.01) ; Calibrated:20.12.2012
- Sensor-Surface: 2mm (Mechanical Surface Detection); 1.0, 31.0
- Electronics: DAE4 Sn777; Calibrated: 22/2/2013
- Phantom: ELI 4.0; Type: QDOVA001DB;
- DASY52 52.8.7(1137); SEMCAD X Version 14.6.10 (7164)

Dipole Calibration for Body Tissue/Pin=250mW, d=15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.362 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 3.90 W/kg
SAR(1 g) = 2.63 W/kg; SAR(10 g) = 1.71 W/kg
Maximum value of SAR (measured) = 3.33 W/kg



0 dB = 3.31 W/kg = 5.19 dBW/kg

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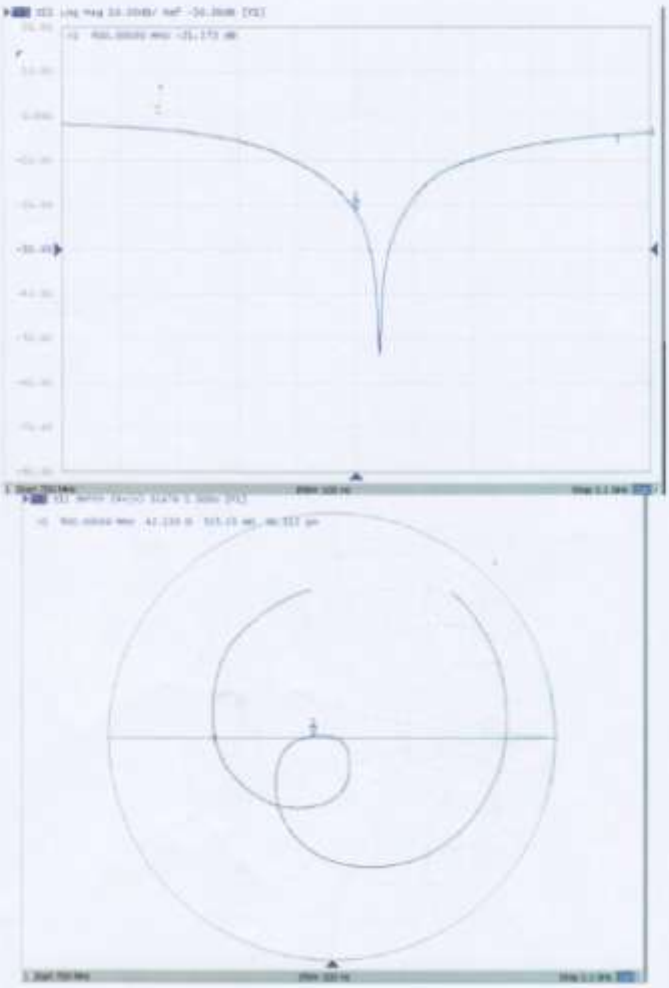
Impedance Measurement Plot for Body TSL



D900V2, serial no. 1d086 Extended Dipole Calibrations

Referring to KDB 865664D01V01r03, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

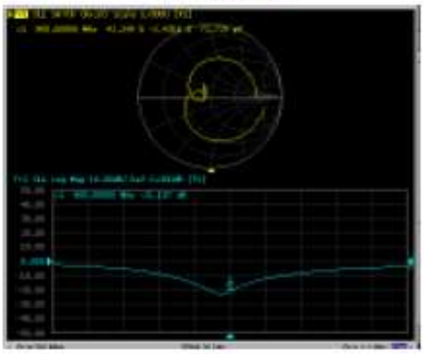
D900V2, serial no. 1d086								
	1900 Head				1900 Body			
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)
2013-8-9	-22.3		49.2		-21.3		42.1	
2014-8-8	-22.21	0.41	49.12	-0.08	-21.1	0.94	42.25	0.15

The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

<Dipole Verification Data>- D900V2, serial no. 1d086

900MHz Head

900MHz Body



June 26, 2013

Acceptable Conditions for SAR Measurements Using Probes and Dipoles Calibrated under the SPEAG-TMC Dual-Logo Calibration Program to Support FCC Equipment Certification

The acceptable conditions for SAR measurements using probes, dipoles and DAEs calibrated by TMC (*Telecommunication Metrology Center of MIIT in Beijing, China*), under the Dual-Logo Calibration Certificate program and quality assurance (QA) protocols established between SPEAG (*Schmid & Partner Engineering AG, Switzerland*) and TMC, to support FCC (*U.S. Federal Communications Commission*) equipment certification are defined and described in the following.

1) The agreement established between SPEAG and TMC is only applicable to calibration services performed by TMC where its clients (companies and divisions of such companies) are headquartered in the Greater China Region, including Taiwan and Hong Kong. This agreement is subject to renewal at the end of each calendar year between SPEAG and TMC. TMC shall inform the FCC of any changes or early termination to the agreement.
2) Only a subset of the calibration services specified in the SPEAG-TMC agreement, while it remains valid, are applicable to SAR measurements performed using such equipment for supporting FCC equipment certification. These are identified in the following.
   a) Calibration of dosimetric (SAR) probes EX3DVx, ET3DVx and ES3DVx.
      i) Free-space E-field and H-field probes, including those used for HAC (hearing aid compatibility) evaluation, temperature probes, other probes or equipment not identified in this document, when calibrated by TMC, are excluded and cannot be used for measurements to support FCC equipment certification.
      ii) Signal specific and bundled probe calibrations based on PMR (probe modulation response) characteristics are handled according to the requirements of KDB 865664; that is, "Until standardized procedures are available to make such determination, the applicability of a signal specific probe calibration for testing specific wireless modes and technologies is determined on a case-by-case basis through KDB inquiries, including SAR system verification requirements."
   b) Calibration of SAR system validation dipoles, excluding HAC dipoles.
   c) Calibration of data acquisition electronics DAE3Vx, DAE4Vx and DAEasyVx.
   d) For FCC equipment certification purposes, the frequency range of SAR probe and dipole calibrations is limited to 700 MHz - 6 GHz and provided it is supported by the equipment identified in the TMC QA protocol (a separate attachment to this document).
   e) The identical system and equipment setup, measurement configurations, hardware, evaluation algorithms, calibration and QA protocols, including the format of calibration certificates and reports used by SPEAG shall be applied by TMC.
   f) The calibrated items are only applicable to SPEAG DASY 4 and DASY 5 or higher version systems.

3) The SPEAG-TMC agreement includes specific protocols identified in the following to ensure the quality of calibration services provided by TMC under this SPEAG-TMC Dual-Logo calibration agreement are equivalent to the calibration services provided by SPEAG. TMC shall, upon request, provide copies of documentation to the FCC to substantiate program implementation.
   a) The Inter-laboratory Calibration Evaluation (ILCE) stated in the TMC QA protocol shall be performed between SPEAG and TMC at least once every 12 months. The ILCE acceptance criteria defined in the TMC QA protocol shall be satisfied for the TMC, SPEAG and FCC agreements to remain valid.
   b) Check of Calibration Certificate (CCC) shall be performed by SPEAG for all calibrations performed by TMC. Written confirmation from SPEAG is required for TMC to issue calibration certificates under the SPEAG-TMC Dual-Logo calibration program. Quarterly reports for all calibrations performed by TMC under the program are also issued by SPEAG.
   c) The calibration equipment and measurement system used by TMC shall be verified before each calibration service according to the specific reference SAR probes, dipoles, and DAE calibrated by SPEAG. The results shall be reproducible and within the defined acceptance criteria specified in the TMC QA protocol before each actual calibration can commence. TMC shall maintain records of the measurement and calibration system verification results for all calibrations.
   d) Quality Check of Calibration (QCC) certificates shall be performed by SPEAG at least once every 12 months. SPEAG shall visit TMC facilities to verify the laboratory, equipment, applied procedures and plausibility of randomly selected certificates.
4) A copy of this document, to be updated annually, shall be provided to TMC clients that accept calibration services according to the SPEAG-TMC Dual-Logo calibration program, which should be presented to a TCB (*Telecommunication Certification Body*), to facilitate FCC equipment approval.
5) TMC shall address any questions raised by its clients or TCBs relating to the SPEAG-TMC Dual-Logo calibration program and inform the FCC and SPEAG of any critical issues.

Change Note: Revised on June 26 to clarify the applicability of PMR and Bundled probe calibrations according to the requirements of KDB 865664.

Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: **SCS 0108**

Client **SMQ (Auden)**

Certificate No: **D1900V2-5d194_Jan15**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d194
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	January 07, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

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

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 7, 2015

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Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.1 ± 6 %	1.39 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.32 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.3 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.3 ± 6 %	1.50 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.95 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**40.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.31 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.3 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.7 Ω + 4.9 jΩ
Return Loss	- 24.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.9 Ω + 5.1 jΩ
Return Loss	- 25.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.201 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 06, 2014

DASY5 Validation Report for Head TSL

Date: 07.12.2015

Test Laboratory: SPEAG, Zurich, Switzerland

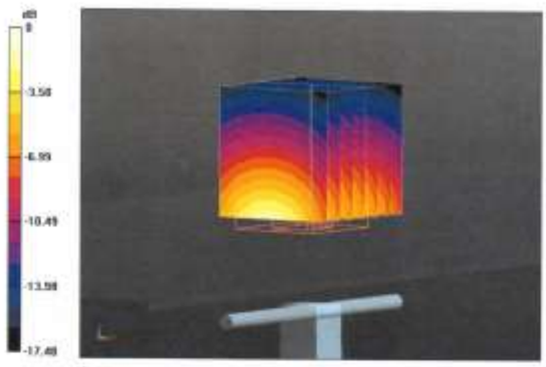
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d194

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.39 S/m; ε_r = 40.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

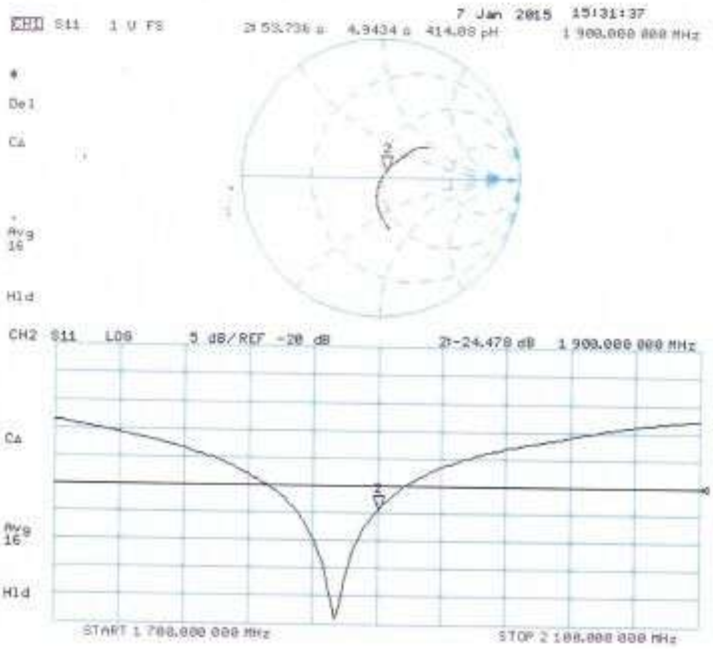
- Probe: ES3DV3 - SN3205; ConvF(5, 5, 5); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.35 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.32 W/kg
Maximum value of SAR (measured) = 12.7 W/kg



0 dB = 12.7 W/kg = 11.04 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

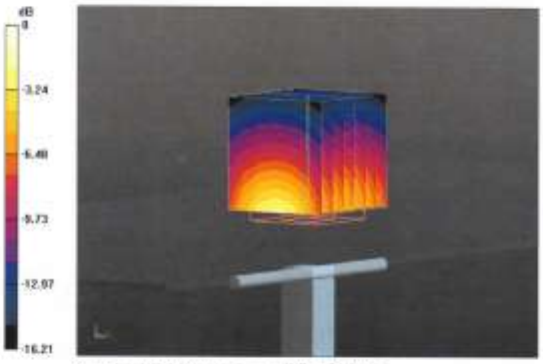
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d194

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.5 S/m; ε_r = 53.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

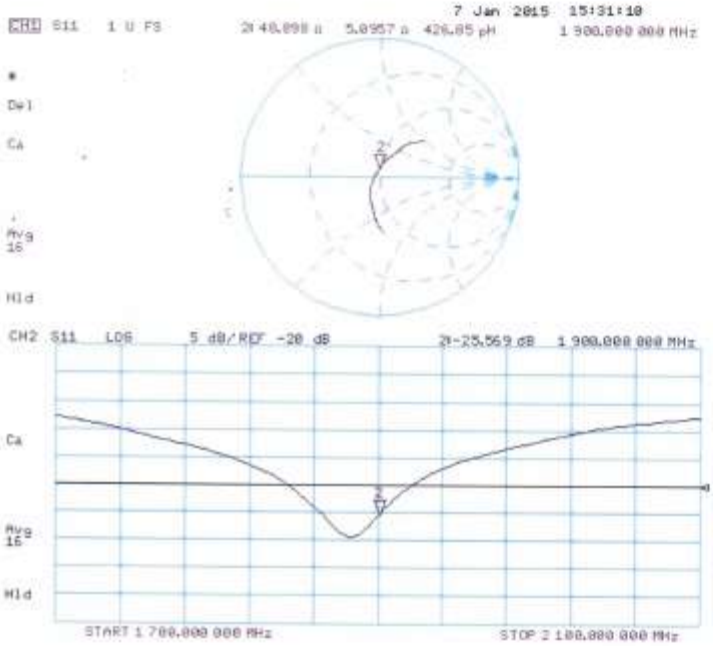
- Probe: ES3DV3 - SN3205; ConvF(4.65, 4.65, 4.65); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.88 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 16.8 W/kg
SAR(1 g) = 9.95 W/kg; SAR(10 g) = 5.31 W/kg
Maximum value of SAR (measured) = 12.6 W/kg



0 dB = 12.6 W/kg = 11.00 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: **SCS 0108**

Client **SMQ (Auden)**

Certificate No: **D2450V2-955_Jan15**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 955
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	January 08, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 8, 2015

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Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	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	39.7 ± 6 %	1.84 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**51.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.00 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.9 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.0 ± 6 %	2.03 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**51.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.2 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.8 Ω + 3.5 jΩ
Return Loss	- 24.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.2 Ω + 4.9 jΩ
Return Loss	- 26.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.165 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 05, 2014

DASY5 Validation Report for Head TSL

Date: 08.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

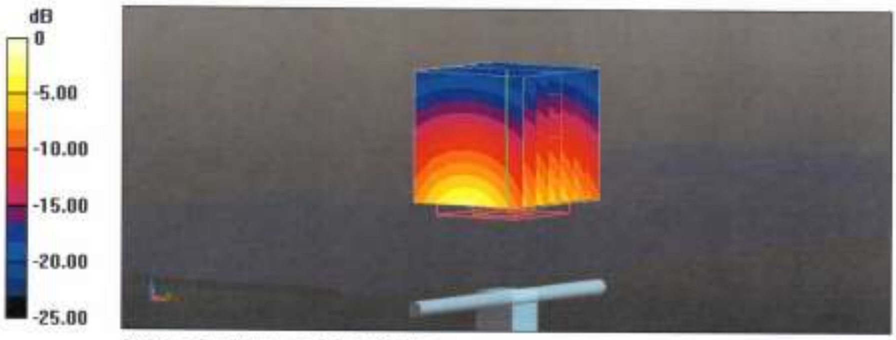
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 955

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.84 S/m; ε_r = 39.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

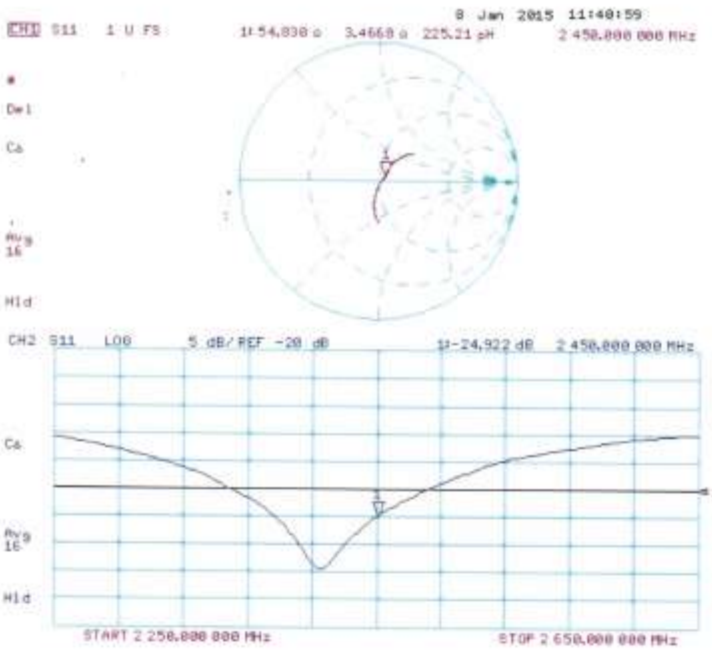
- Probe: ES3DV3 - SN3205; ConvF(4.54, 4.54, 4.54); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 100.1 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 27.0 W/kg
SAR(1 g) = 13 W/kg; SAR(10 g) = 6 W/kg
Maximum value of SAR (measured) = 17.2 W/kg



0 dB = 17.2 W/kg = 12.36 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 08.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

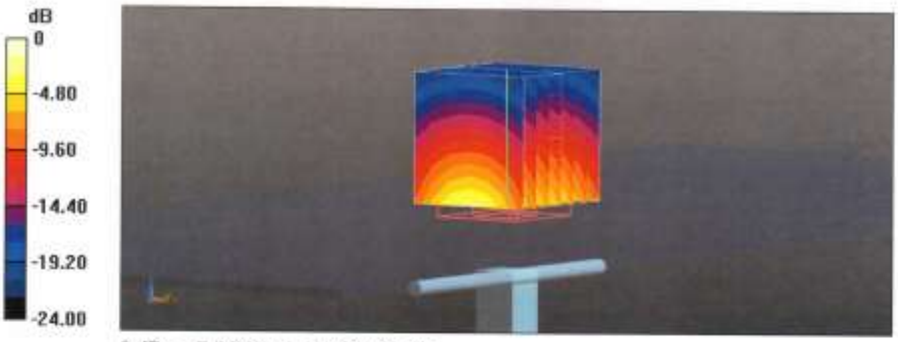
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 955

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.03 S/m; ε_r = 51; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

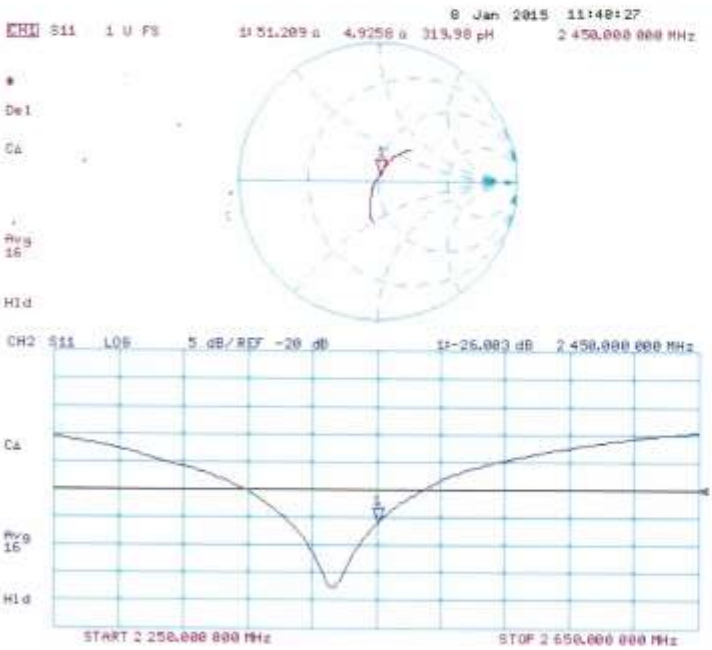
- Probe: ES3DV3 - SN3205; ConvF(4.32, 4.32, 4.32); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.24 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 27.8 W/kg
SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.14 W/kg
Maximum value of SAR (measured) = 17.7 W/kg



0 dB = 17.7 W/kg = 12.48 dBW/kg

Impedance Measurement Plot for Body TSL



Acceptable Conditions for SAR Measurements Using Probes and Dipoles Calibrated under the SPEAG-TMC Dual-Logo Calibration Program to Support FCC Equipment Certification

The acceptable conditions for SAR measurements using probes, dipoles and DAEs calibrated by TMC (*Telecommunication Metrology Center of MITT in Beijing, China*), under the Dual-Logo Calibration Certificate program and quality assurance (QA) protocols established between SPEAG (*Schmid & Partner Engineering AG, Switzerland*) and TMC, to support FCC (*U.S. Federal Communications Commission*) equipment certification are defined and described in the following.

1) The agreement established between SPEAG and TMC is only applicable to calibration services performed by TMC where its clients (companies and divisions of such companies) are headquartered in the Greater China Region, including Taiwan and Hong Kong. This agreement is subject to renewal at the end of each calendar year between SPEAG and TMC. TMC shall inform the FCC of any changes or early termination to the agreement.
2) Only a subset of the calibration services specified in the SPEAG-TMC agreement, while it remains valid, are applicable to SAR measurements performed using such equipment for supporting FCC equipment certification. These are identified in the following.
   a) Calibration of dosimetric (SAR) probes EX3DVx, ET3DVx and ES3DVx.
      i) Free-space E-field and H-field probes, including those used for HAC (hearing aid compatibility) evaluation, temperature probes, other probes or equipment not identified in this document, when calibrated by TMC, are excluded and cannot be used for measurements to support FCC equipment certification.
      ii) Signal specific and bundled probe calibrations based on PMR (probe modulation response) characteristics are handled according to the requirements of KDB 865664; that is, "Until standardized procedures are available to make such determination, the applicability of a signal specific probe calibration for testing specific wireless modes and technologies is determined on a case-by-case basis through KDB inquiries, including SAR system verification requirements."
   b) Calibration of SAR system validation dipoles, excluding HAC dipoles.
   c) Calibration of data acquisition electronics DAE3Vx, DAE4Vx and DAEasyVx.
   d) For FCC equipment certification purposes, the frequency range of SAR probe and dipole calibrations is limited to 700 MHz - 6 GHz and provided it is supported by the equipment identified in the TMC QA protocol (a separate attachment to this document).
   e) The identical system and equipment setup, measurement configurations, hardware, evaluation algorithms, calibration and QA protocols, including the format of calibration certificates and reports used by SPEAG shall be applied by TMC.
   f) The calibrated items are only applicable to SPEAG DASY 4 and DASY 5 or higher version systems.

3) The SPEAG-TMC agreement includes specific protocols identified in the following to ensure the quality of calibration services provided by TMC under this SPEAG-TMC Dual-Logo calibration agreement are equivalent to the calibration services provided by SPEAG. TMC shall, upon request, provide copies of documentation to the FCC to substantiate program implementation.
   a) The Inter-laboratory Calibration Evaluation (ILCE) stated in the TMC QA protocol shall be performed between SPEAG and TMC at least once every 12 months. The ILCE acceptance criteria defined in the TMC QA protocol shall be satisfied for the TMC, SPEAG and FCC agreements to remain valid.
   b) Check of Calibration Certificate (CCC) shall be performed by SPEAG for all calibrations performed by TMC. Written confirmation from SPEAG is required for TMC to issue calibration certificates under the SPEAG-TMC Dual-Logo calibration program. Quarterly reports for all calibrations performed by TMC under the program are also issued by SPEAG.
   c) The calibration equipment and measurement system used by TMC shall be verified before each calibration service according to the specific reference SAR probes, dipoles, and DAE calibrated by SPEAG. The results shall be reproducible and within the defined acceptance criteria specified in the TMC QA protocol before each actual calibration can commence. TMC shall maintain records of the measurement and calibration system verification results for all calibrations.
   d) Quality Check of Calibration (QCC) certificates shall be performed by SPEAG at least once every 12 months. SPEAG shall visit TMC facilities to verify the laboratory, equipment, applied procedures and plausibility of randomly selected certificates.
4) A copy of this document, to be updated annually, shall be provided to TMC clients that accept calibration services according to the SPEAG-TMC Dual-Logo calibration program, which should be presented to a TCB (*Telecommunication Certification Body*), to facilitate FCC equipment approval.
5) TMC shall address any questions raised by its clients or TCBs relating to the SPEAG-TMC Dual-Logo calibration program and inform the FCC and SPEAG of any critical issues.

Change Note: Revised on June 26 to clarify the applicability of PMR and Bundled probe calibrations according to the requirements of KDB 865664.

China National Accreditation Service for Conformity Assessment

LABORATORY ACCREDITATION CERTIFICATE

(Registration No. CNAS L6487)

Shenzhen Sunway Communication Co., Ltd. Testing Center

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is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) *for the competence of testing.*

The scope of accreditation is detailed in the attached appendices bearing the same registration number as above. The appendices form an integral part of this certificate.

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Signed on behalf of China National Accreditation Service for Conformity Assessment

China National Accreditation Service for Conformity Assessment (CNAS) is authorized by Certification and Accreditation Administration of the People's Republic of China (CNCA) to operate the national accreditation schemes for conformity assessment. CNAS is the signatory to International Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (ILAC MRA) and Asia Pacific Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (APLAC MRA).

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*****END OF REPORT*****