SAR TEST REPORT

Applicant	ZTE CORPORATION
FCC ID	SRQ-ZTEBLADEL5
Product	WCDMA/GSM (GPRS) Dual-Mode Digital Mobile Phone
Model	ZTE Blade L5 /Blade L5 /ZTE L5/ZTE Blade M/Blade M
Report No.	RXA1512-0218SAR02R4
Issue Date	January 12, 2016

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **IEEE 1528- 2013, ANSI/IEEE C95.1-1991.** The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Jiangpeng Lan

Reviewed by: Jiangpeng Lan

Kai Xu

Approved by: Kai Xu

TESTING
No. L2264

TA Technology (Shanghai) Co., Ltd.

No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China

TEL: +86-021-50791141/2/3

FAX: +86-021-50791141/2/3-8000

Table of Contents

1 Test Laboratory 4
1.1 Notes of the Test Report 4
1.2 Test facility 4
1.3 Testing Location 5
1.4 Laboratory Environment 5
2 Statement of Compliance 6
3 Description of Equipment under Test 7
4 Test Specification, Methods and Procedures 9
5 Operational Conditions during Test 10
5.1 Test Positions 10
5.1.1 Against Phantom Head 10
5.1.2 Body Worn Configuration 10
5.2 Measurement Variability 11
5.3 Test Configuration 12
5.3.1 GSM Test Configuration 12
5.3.2 UMTS Test Configuration 12
5.3.3 WiFi Test Configuration 16
6 SAR Measurements System Configuration 17
6.1 SAR Measurement Set-up 17
6.2 DASY5 E-field Probe System 18
6.3 SAR Measurement Procedure 19
7 Main Test Equipment 21
8 Tissue Dielectric Parameter Measurements & System Verification 22
8.1 Tissue Verification 22
8.2 System Performance Check 23
9 Nominal and Maximum Output Power 26
9.1 GSM Mode 26
9.2 WCDMA Mode 27
9.3 WLAN Mode 28
9.4 Bluetooth Mode 29
10 Measured and Reported (Scaled) SAR Results 30
10.1 EUT Antenna Locations 30
10.2 Measured SAR Results 31
10.3 Simultaneous Transmission Analysis 38
ANNEX A: Test Layout 42
ANNEX B: System Check Results 46
ANNEX C: Highest Graph Results 54
ANNEX D: Probe Calibration Certificate 67
ANNEX E: D835V2 Dipole Calibration Certificate 78
ANNEX F: D1900V2 Dipole Calibration Certificate 86
ANNEX G: D2450V2 Dipole Calibration Certificate 94

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ANNEX H: DAE4 Calibration Certificate 102
ANNEX I: The EUT Appearances and Test Configuration 107

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1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd).**The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above. This report must not be used by the client to claim product certification, approval, or endorsement by CNAS or any government agencies.

1.2 Test facility

CNAS (accreditation number:L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (recognition number is 428261)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

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1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.

Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China

City: Shanghai

Post code: 201201

Country: P. R. China

Contact: Xu Kai

Telephone: +86-021-50791141/2/3

Fax: +86-021-50791141/2/3-8000

Website: http://www.ta-shanghai.com

E-mail: xukai@ta-shanghai.com

1.4 Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

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2 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for the EUT are as follows:

Table 2.1: Highest Reported SAR

Mode	Highest Reported SAR (W/kg)			
	1g SAR Head	1g SAR Body-worn	1g SAR Hotspot	10g SAR Extremity
GSM 850	0.21	0.46	0.81	NA
GSM 1900	0.22	0.85	1.47	NA
WCDMA Band II	0.39	1.38	1.48	NA
WCDMA Band V	0.14	0.33	0.33	NA
Wi-Fi	0.68	0.16	0.16	NA
Date of Testing:	December 14, 2015~ December 16, 2015 and December 30, 2015			
Note: The device is in compliance with SAR for Uncontrolled Environment /General Population exposure limits (1.6 W/kg and 4.0 W/kg) specified in ANSI/IEEE C95.1-1991, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013.				

Table 2.2: Highest Simultaneous Transmission SAR

Exposure Configuration	1g SAR Head	1g SAR Body-worn	1g SAR Hotspot	10g SAR Extremity
Highest Simultaneous Transmission SAR (W/kg)	1.06	1.54	1.54	NA
Note: 1. The detail for simultaneous transmission consideration is described in chapter 10.				

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3 Description of Equipment under Test

Client Information

Applicant	ZTE CORPORATION
Applicant address	ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057 P.R. China
Manufacturer	ZTE CORPORATION
Manufacturer address	ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057 P.R. China

Accessory Equipment Details

Name	Model	Manufacturer	Note
Battery	Li3821T43P3h745741	Ruide Electronical Industrial Co., Ltd	2150mAh
Charger	RD0501000-USBA-18OG	Ruide Electronical Industrial Co., Ltd	/
Earphone	B020	LONGTUOXIN	/

General Technologies

Application Purpose:	Original Grant
EUT Stage:	Production Unit
Model:	ZTE Blade L5 /Blade L5 /ZTE L5/ZTE Blade M/Blade M
IMEI/SN/MEID:	869050020002338
Hardware Version:	MB_C
Software Version:	ZTE_CN_QB25S_P172A40V1.0.0
Antenna Type:	Internal Antenna
Device Class:	B
Power Class:	GSM 850:4 GSM 1900:1 UMTS Band II/V:3
Power Level	GSM 850:level 5 GSM 1900:level 0 UMTS Band II/V:all up bits

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Wireless Technology and Frequency Range

Wireless Technology		Modulation	Operating mode	Tx (MHz)
GSM	850	Voice(GMSK) GPRS(GMSK)	☐Multi-slot Class:8-1UP ☐Multi-slot Class:10-2UP ☒Multi-slot Class:12-4UP ☐Multi-slot Class:33-4UP	824 ~ 849
	1900			1850 ~ 1910
	Does this device support DTM (Dual Transfer Mode)? ☐Yes ☒No			
UMTS	Band II	QPSK	HSDPA UE Category: 24 HSUPA UE Category: 7	1850 ~ 1910
	Band V			824 ~ 849
BT	2.4G	Version 4.0 BT-LE		2400 ~ 2480
Wi-Fi	2.4G	CCK	802.11b/g/n (HT20)	2402 ~ 2472
	Does this device support 2.4G MIMO? ☐Yes ☒No			

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4 Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE 1528- 2013, ANSI/IEEE C95.1-1991, the following FCC Published RF exposure KDB procedures:

248227 D01 SAR meas for 802.11 v02r02
447498 D01 General RF Exposure Guidance v06
865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
865664 D02 RF Exposure Reporting v01r02
941225 D01 3G SAR Procedures v03r01
941225 D06 Hotspot Mode v02r01

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5 Operational Conditions during Test

5.1 Test Positions

5.1.1 Against Phantom Head

Measurements were made in “cheek” and “tilt” positions on both the left hand and right hand sides of the phantom.

The positions used in the measurements were according to IEEE 1528 - 2013 "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate(SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques".

5.1.2 Body Worn Configuration

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations.

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration. Per FCC KDB Publication 648474 D04, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

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

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented. Transmitters that are designed to operate in front of a person’s face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

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5.2 Measurement Variability

Per FCC KDB Publication 865664 D01, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:
1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

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5.3 Test Configuration

5.3.1 GSM Test Configuration

According to specification 3GPP TS 51.010, the maximum power of the GSM can do the power reduction for the multi-slot. The allowed power reduction in the multi-slot configuration is as following:

Output power of reductions:

Table 5.1: The allowed power reduction in the multi-slot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power,(dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

5.3.2 UMTS Test Configuration

3G SAR Test Reduction Procedure

In the following procedures, the mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.3 This is referred to as the 3G SAR test reduction procedure in the following SAR test guidance, where the primary mode is identified in the applicable wireless mode test procedures and the secondary mode is wireless mode being considered for SAR test reduction by that procedure. When the 3G SAR test reduction procedure is not satisfied, it is identified as “otherwise” in the applicable procedures; SAR measurement is required for the secondary mode.

Output power Verification

Maximum output power is verified on the high, middle and low channels according to procedures described in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all “1’s” for WCDMA/HSDPA or by applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HSDPA, HSPA) are requied in the SAR report. All configurations that are not supported by the handset or cannot be measured due to technical or equipment limitations must be clearly identified.

Head SAR

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured

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to all “1’s”. The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for 12.2 kbps AMR in 3.4 kbps SRB (signaling radio bearer) using the highest reported SAR configuration in 12.2 kbps RMC for head exposure.

Body-Worn Accessory SAR

SAR for body-worn accessory configurations is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreaing code or DPDCHn, for the highest reported body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When more than 2 DPDCHn are supported by the handset, it may be necessary to configure additional DPDCHn using FTM (Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384 kbps and 768 kbps RMC.

Handsets with Release 5 HSDPA

The 3G SAR test reduction procedure is applied to HSDPA body-worn accessory configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSDPA using the HSDPA body SAR procedures in the “Release 5 HSDPA Data Devices” section of this document, for the highest reported SAR body-worn accessory exposure configuration in 12.2 kbps RMC. Handsets with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.
HSDPA should be configured according to the UE category of a test device.The number of HSDSCH/ HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors(βc, βd), and HS-DPCCH power offset parameters (ΔACK, ΔNACK, ΔCQI) should be set according to values indicated in the Table below. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

Table 5.2: Subtests for UMTS Release 5 HSDPA

Sub-set	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (note 1, note 2)	CM(dB) (note 3)	MPR(dB)
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

Note1: △ACK, △NACK and △CQI=8 Ahs = βhs/βc=30/15 βhs=30/15*βc
Note2: CM=1 for β_c/β_d =12/15, β_{hs}/β_c=24/15.
Note3: For subtest 2 the $\beta_c\beta_d$ ratio of 12/15 for the TFC during the measurement period(TF1,TF0) is achieved by setting the signaled gain factors for the reference TFC (TFC1,TF1) to β_c=11/15 and β_d=15/15.

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Table 5.5: HS-DSCH UE category

Table 5.1a: FDD HS-DSCH physical layer categories

HS-DSCH category	Maximum number of HS-DSCH codes received	Minimum inter-TTI interval	Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI NOTE 1	Total number of soft channel bits	Supported modulations without MIMO operation or dual cell operation	Supported modulations with MIMO operation and without dual cell operation	Supported modulations with dual cell operation
Category 1	5	3	7298	19200	QPSK, 16QAM	Not applicable (MIMO not supported)	Not applicable (dual cell operation not supported)
Category 2	5	3	7298	28800			
Category 3	5	2	7298	28800			
Category 4	5	2	7298	38400			
Category 5	5	1	7298	57600			
Category 6	5	1	7298	67200			
Category 7	10	1	14411	115200			
Category 8	10	1	14411	134400			
Category 9	15	1	20251	172800			
Category 10	15	1	27952	172800			
Category 11	5	2	3630	14400	QPSK		
Category 12	5	1	3630	28800			
Category 13	15	1	35280	259200	QPSK, 16QAM, 64QAM		
Category 14	15	1	42192	259200			
Category 15	15	1	23370	345600	QPSK, 16QAM		
Category 16	15	1	27952	345600			
Category 17 NOTE 2	15	1	35280	259200	QPSK, 16QAM, 64QAM	–	
			23370	345600	–	QPSK, 16QAM	
Category 18 NOTE 3	15	1	42192	259200	QPSK, 16QAM, 64QAM	–	
			27952	345600	–	QPSK, 16QAM	
Category 19	15	1	35280	518400	QPSK, 16QAM, 64QAM		
Category 20	15	1	42192	518400			
Category 21	15	1	23370	345600	-	-	QPSK, 16QAM
Category 22	15	1	27952	345600			
Category 23	15	1	35280	518400			QPSK, 16QAM, 64QAM
Category 24	15	1	42192	518400			

HSUPA Test Configuration

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body-worn accessory configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSPA using the HSPA body SAR procedures in the “Release 6 HSPA Data Devices” section of this document, for the highest reported body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When VOIP is applicable for next to the ear head exposure in HSPA, the 3G SAR test reduction procedure is applied to HSPA with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body-worn accessory measurements is tested for next to the ear head exposure.

Due to inner loop power control requirements in HSPA, a communication test set is required for output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA are configured according to the β values indicated in Table 2 and other applicable procedures

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described in the 'WCDMA Handset' and 'Release 5 HSDPA Data Devices' sections of this document

Table 5.3: Sub-Test 5 Setup for Release 6 HSUPA

Sub-set	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM (2) (dB)	MPR (dB)	AG (4) Index	E-TFCI
1	11/15 (3)	15/15 (3)	64	11/15 (3)	22/15	209/225	1039/225	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_{ed1}: 47/15 β_{ed2}: 47/15	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 (4)	15/15 (4)	64	15/15 (4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, ΔNACK and Δ_{CQI} = 8 $\Leftrightarrow A_{hs} = \beta_{hs}/\beta_c$ = 30/15 $\Leftrightarrow \beta_{hs}$= 30/15 *$\beta_c$.

Note 2: CM = 1 for βc/βd =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 βc/βd ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to βc = 10/15 and βd = 15/15.

Note 4: For subtest 5 the βc/βd ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to βc = 14/15 and βd = 15/15.

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Figure 5.1g.

Note 6: βed can not be set directly; it is set by Absolute Grant Value.

Table 5.4: HSUPA UE category

UE E-DCH Category	Maximum E-DCH Codes Transmitted	Number of HARQ Processes	E-DCH TTI (ms)	Minimum Spreading Factor	Maximum E-DCH Transport Block Bits	Max Rate (Mbps)
1	1	4	10	4	7110	0.7296
2	2	8	2	4	2798	1.4592
	2	4	10	4	14484	
3	2	4	10	4	14484	1.4592
4	2	8	2	2	5772	2.9185
	2	4	10	2	20000	2.00
5	2	4	10	2	20000	2.00
6 (No DPDCH)	4	8	2	2 SF2 & 2 SF4	11484	5.76
	4	4	10		20000	2.00
7 (No DPDCH)	4	8	2	2 SF2 & 2 SF4	22996	?
	4	4	10		20000	?

NOTE: When 4 codes are transmitted in parallel, two codes shall be transmitted with SF2 and two with SF4.
UE Categories 1 to 6 supports QPSK only. UE Category 7 supports QPSK and 16QAM. (TS25.306-7.3.0)

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5.3.3 WiFi Test Configuration

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the *initial test position(s)* by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The *initial test position(s)* is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the *reported* SAR for the *initial test position* is:

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the *initial test position* to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the *reported* SAR is ≤ 0.8 W/kg or all required test positions are tested.
    - ✧ For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
    - ✧ When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the *initial test position* and subsequent test positions, when the *reported* SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the *reported* SAR is ≤ 1.2 W/kg or all required test channels are considered.
    - ✧ The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.

To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.

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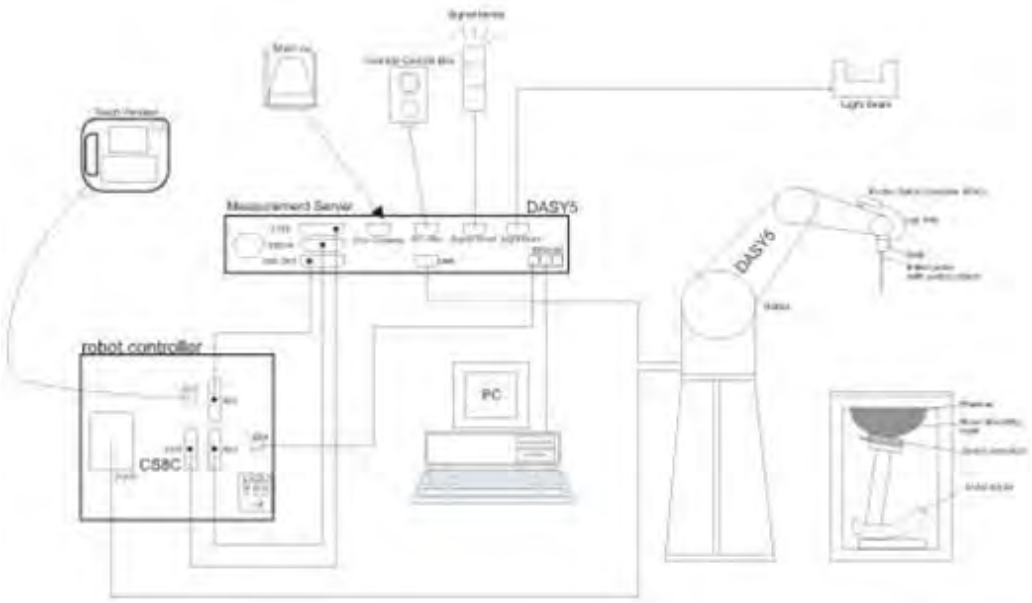
6 SAR Measurements System Configuration

6.1 SAR Measurement Set-up

The DASY 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).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

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6.2 DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

EX3DV4 Probe Specification

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure Scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based

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temperature probe is used in conjunction with the E-field probe.

SAR=C∆T/∆t

Where: ∆t = Exposure time (30 seconds),

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

∆T = Temperature increase due to RF exposure.

Or

SAR=$|E|^2\sigma/\rho$

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

6.3 SAR Measurement Procedure

Power Reference Measurement

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

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 fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

	≤3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: ΔxArea, ΔyArea	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

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Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

<table>
<tr><td colspan="3"></td><td>≤3GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution:$\triangle x_{zoom}$ $\triangle y_{zoom}$</td><td>≤2GHz: ≤8mm
2 – 3GHz: ≤5mm*</td><td>3 – 4GHz: ≤5mm*
4 – 6GHz: ≤4mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">Uniform grid: $\triangle z_{zoom}(n)$</td><td>≤5mm</td><td>3 – 4GHz: ≤4mm
4 – 5GHz: ≤3mm
5 – 6GHz: ≤2mm</td></tr>
<tr><td rowspan="2">Graded grid</td><td>$\triangle z_{zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤4mm</td><td>3 – 4GHz: ≤3mm
4 – 5GHz: ≤2.5mm
5 – 6GHz: ≤2mm</td></tr>
<tr><td>$\triangle z_{zoom}(n>1)$: between subsequent points</td><td colspan="2">≤1.5•$\triangle z_{zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">X, y, z</td><td>≥30mm</td><td>3 – 4GHz: ≥28mm
4 – 5GHz: ≥25mm
5 – 6GHz: ≥22mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2013 for details.
* When zoom scan is required and the <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4W/kg, ≤8mm, ≤7mm and ≤5mm zoom scan resolution may be applied, respectively, for 2GHz to 3GHz, 3GHz to 4GHz and 4GHz to 6GHz.</td></tr>
</table>

Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

Power Drift Monitoring

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

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7 Main Test Equipment

Name of Equipment	Manufacturer	Type/Model	Serial Number	Last Cal.	Cal. Due Date
Network analyzer	Agilent	8753E	US37390326	2015-09-08	2016-09-07
Network analyzer	Agilent	E5071B	MY42404014	2015-05-25	2016-05-24
Dielectric Probe Kit	Agilent	85070E	US44020115	No Calibration Requested	
Power meter	Agilent	E4417A	GB41291714	2015-03-08	2016-03-07
Power sensor	Agilent	N8481H	MY50350004	2015-05-25	2016-05-24
Power sensor	Agilent	E9327A	US40441622	2015-05-25	2017-05-24
Dual directional coupler	Agilent	778D-012	50519	2015-03-23	2016-03-22
Dual directional coupler	Agilent	777D	50146	2015-03-23	2016-03-22
Amplifier	INDEXSAR	IXA-020	0401	No Calibration Requested	
Wideband radio communication tester	R&S	CMW 500	113645	2015-05-25	2016-05-24
E-field Probe	SPEAG	EX3DV4	3677	2015-01-30	2016-01-29
DAE	SPEAG	DAE4	1317	2015-01-29	2016-01-28
Validation Kit 835MHz	SPEAG	D835V2	4d020	2014-08-28	2017-08-27
Validation Kit 1900MHz	SPEAG	D1900V2	5d060	2014-09-01	2017-08-31
Validation Kit 2450MHz	SPEAG	D2450V2	786	2014-09-01	2017-08-31
Temperature Probe	Tianjin jinming	JM222	AA1009129	2015-03-08	2016-03-07
Hygrothermograph	Tianjin jinming	WS-1	64591	2015-05-25	2016-05-24

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8 Tissue Dielectric Parameter Measurements & System Verification

8.1 Tissue Verification

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance.

Target values

Frequency (MHz)		Water (%)	Salt (%)	Sugar (%)	Glycol (%)	Preventol (%)	Cellulose (%)	ε_r	σ(s/m)
head	835	41.45	1.45	56	0	0.1	1.0	41.5	0.90
	1900	55.242	0.306	0	44.452	0	0	40.0	1.40
	2450	62.7	0.5	0	36.8	0	0	39.2	1.80
body	835	52.5	1.4	45	0	0.1	1.0	55.2	0.97
	1900	69.91	0.13	0	29.96	0	0	53.3	1.52
	2450	73.2	0.1	0	26.7	0	0	52.7	1.95

Measurements results

Frequency(MHz)		Test Date	Temp ℃	Measured Dielectric Parameters		Target Dielectric Parameters		Limit (Within ±5%)	
				ε_r	σ(s/m)	ε_r	σ(s/m)	Dev ε_r(%)	Dev σ(%)
head	835	12/14/2015	21.5	41.4	0.88	41.5	0.90	-0.24	-2.22
	1900	12/15/2015	21.5	40.7	1.41	40.0	1.40	1.75	0.71
	2450	12/16/2015	21.5	38.6	1.81	39.2	1.80	-1.53	0.56
body	835	12/14/2015	21.5	54.2	0.96	55.2	0.97	-1.81	-1.03
	835	12/30/2015	21.5	54.4	0.95	55.2	0.97	-1.45	-2.06
	1900	12/15/2015	21.5	52.6	1.51	53.3	1.52	-1.31	-0.66
	1900	12/30/2015	21.5	52.5	1.53	53.3	1.52	-1.50	0.66
	2450	12/16/2015	21.5	52.5	1.98	52.7	1.95	-0.38	1.54
Note: The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.									

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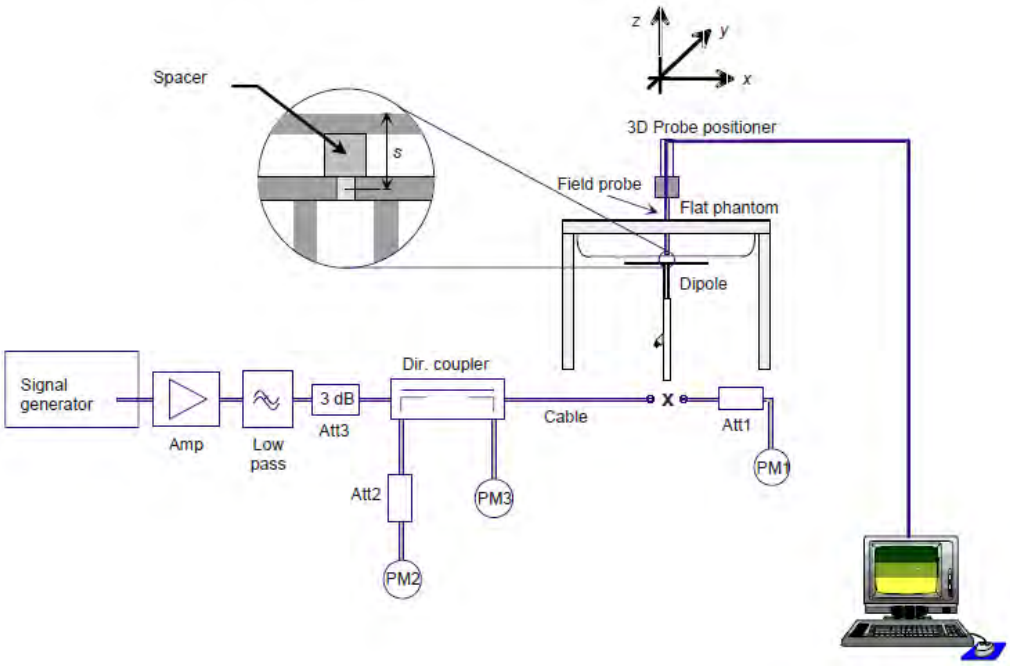
8.2 System Performance Check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were measured using the dielectric probe kit and the network analyzer. A system check measurement for every day was made following the determination of the dielectric parameters of the Tissue simulates, using the dipole validation kit. The dipole antenna was placed under the flat section of the twin SAM phantom.

System check is performed regularly on all frequency bands where tests are performed with the DASY system.



Picture 1 System Performance Check setup

Picture 2 Setup Photo

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Justification for Extended SAR Dipole Calibrations

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

Dipole D835V2 SN: 4d020				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
8/28/2014	-30.1	/	48.6	/
8/27/2015	-31.1	3.3%	49.7	1.1Ω
Body Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
8/28/2014	-23.3	/	54.0	/
8/27/2015	-23.9	2.6%	53.5	0.5Ω

Dipole D1900V2 SN: 5d060				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
9/1/2014	-22.8	/	54.1	/
8/31/2015	-23.7	3.9%	55.4	1.3Ω
Body Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
9/1/2014	-21.6	/	57.6	/
8/31/2015	-20.8	3.7%	57.3	0.3Ω

Dipole D2450V2 SN: 786				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
9/1/2014	-23.6	/	57.1	/
8/31/2015	-23.9	1.3%	57.4	0.3Ω
Body Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
9/1/2014	-23.7	/	56.0	/
8/31/2015	-24	1.3%	55.8	0.2Ω

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System Check results

Frequency (MHz)		Test Date	Temp ℃	250mW Measured SAR_{1g} (W/kg)	1W Normalized SAR_{1g} (W/kg)	1W Target SAR_{1g} (W/kg)	Limit (±10%)	Figure No.
Head	835	12/14/2015	21.5	2.44	9.76	9.54	2.31	Figure 1
	1900	12/15/2015	21.5	9.48	37.92	39.20	-3.26	Figure 2
	2450	12/16/2015	21.5	13.70	54.80	52.50	4.38	Figure 3
body	835	12/14/2015	21.5	2.41	9.64	9.54	1.05	Figure 4
	835	12/30/2015	21.5	2.46	9.84	9.54	3.14	Figure 5
	1900	12/15/2015	21.5	9.93	39.72	40.00	-0.70	Figure 6
	1900	12/30/2015	21.5	9.82	39.28	40.00	-1.80	Figure 7
	2450	12/16/2015	21.5	12.50	50.00	52.40	-4.58	Figure 8
Note：Target Values used derive from the calibration certificate Data Storage and Evaluation.								

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9 Nominal and Maximum Output Power

KDB 447498 D01 at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

9.1 GSM Mode

GSM 850		Burst Average Power(dBm)			Division Factors (dB)	Frame-Average Power(dBm)			Tune-up Limit (dBm)
Tx Channel		128	190	251		128	190	251	
Frequency(MHz)		824.2	836.6	848.8		824.2	836.6	848.8	
GSM(GMSK)		32.27	32.28	32.32	9.03	23.24	23.25	23.29	33
GPRS (GMSK)	1Txslot	32.26	32.31	32.33	9.03	23.23	23.28	23.30	33
	2Txslots	31.53	31.58	31.59	6.02	25.51	25.56	25.57	32
	3Txslots	29.77	29.81	29.83	4.26	25.51	25.55	25.57	30.5
	4Txslots	28.72	28.72	28.77	3.01	**25.71**	**25.71**	**25.76**	29
GSM 1900		Power(dBm)			Division Factors (dB)	Power(dBm)			Tune-up Limit (dBm)
Tx Channel		512	661	810		512	661	810	
Frequency(MHz)		1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM(GMSK)		28.98	28.99	29.10	9.03	19.95	19.96	20.07	29.5
GPRS (GMSK)	1Txslot	29.13	29.18	29.07	9.03	20.10	20.15	20.04	29.5
	2Txslots	28.41	28.46	28.39	6.02	22.39	22.44	22.37	29
	3Txslots	26.63	26.72	26.71	4.26	22.37	22.46	22.45	27
	4Txslots	25.49	25.61	25.65	3.01	**22.48**	**22.60**	**22.64**	26

Notes: The worst-case configuration and mode for SAR testing is determined to be as follows:

1. Standalone: GSM 850 GMSK (GPRS) mode with 4 time slots for Max power, GSM 1900 GMSK (GPRS) mode with 4 time slots for Max power, based on the output power measurements above.

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9.2 WCDMA Mode

WCDMA		Band II(dBm)				Band V(dBm)			
Tx Channel		9262	9400	9538	Tune-up Limit (dBm)	4132	4183	4233	Tune-up Limit (dBm)
Frequency(MHz)		1852.4	1880	1907.6		826.4	836.6	846.6	
12.2kbps RMC		22.27	21.90	22.30	22.5	22.45	22.48	22.32	23.0
64kbps RMC		21.97	21.89	21.73		22.47	22.49	22.29	
144kbps RMC		21.98	21.93	21.75		22.51	22.51	22.32	
384kbps RMC		22.00	21.93	21.76		22.49	22.52	22.31	
HSDPA	Subtest 1	21.37	21.28	21.02	21.5	22.56	22.56	22.32	23.0
	Subtest 2	21.23	21.07	21.08		22.42	22.35	22.38	
	Subtest 3	21.26	21.29	21.02		22.45	22.57	22.32	
	Subtest 4	21.17	21.35	21.03		22.36	22.63	22.33	
HSUPA	Subtest 1	20.84	20.91	20.53	21.0	21.33	21.49	21.13	21.7
	Subtest 2	19.52	19.61	19.22		20.01	20.19	19.82	
	Subtest 3	20.26	20.22	19.70		20.75	20.80	20.30	
	Subtest 4	19.55	19.70	19.17		20.04	20.28	19.77	
	Subtest 5	20.90	20.94	20.69		21.39	21.52	21.29	

Note: 1.Per KDB 941225 D01, SAR for Head / Hotspot / Body-worn exposure is measured using a 12.2 kbps AMR with TPC bits configured to all “1’s”.

2.When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

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9.3 WLAN Mode

Band	Mode	Data Rate	Channel/Frequency(MHz)			Tune-up Limit (dBm)
			1/2412	6/2437	11/2462	
2.4G	80.2 11b	1M	14.05	14.01	14.12	14.5
	80.2 11g	6M	13.56	13.72	13.60	14
	80.2 11n (HT20)	6.5M	12.32	12.67	12.53	13
Note. SAR is not required when the maximum output power in 802.11g/n HT20 channels less than 802. 11b.						

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9.4 Bluetooth Mode

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Tune-up Limit (dBm)
GFSK(dBm)	1.45	1.28	0.97	2
π/4DQPSK(dBm)	1.32	1.01	0.57	
8DPSK(dBm)	1.28	1.00	0.55	
BLE	**Ch 0 2402 MHz**	**Ch 19 2440 MHz**	**Ch 39 2480 MHz**	**Tune-up Limit (dBm)**
GFSK	-5.87	-5.84	-6.23	-5

Per KDB 447498 D01, 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)] ·[√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

Per KDB 447498 D01, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Bluetooth	Distance(mm)	MAX Power (dBm)	Ratio	Evaluation
Head	5	2	0.499	No
Body	10	2	0.250	No

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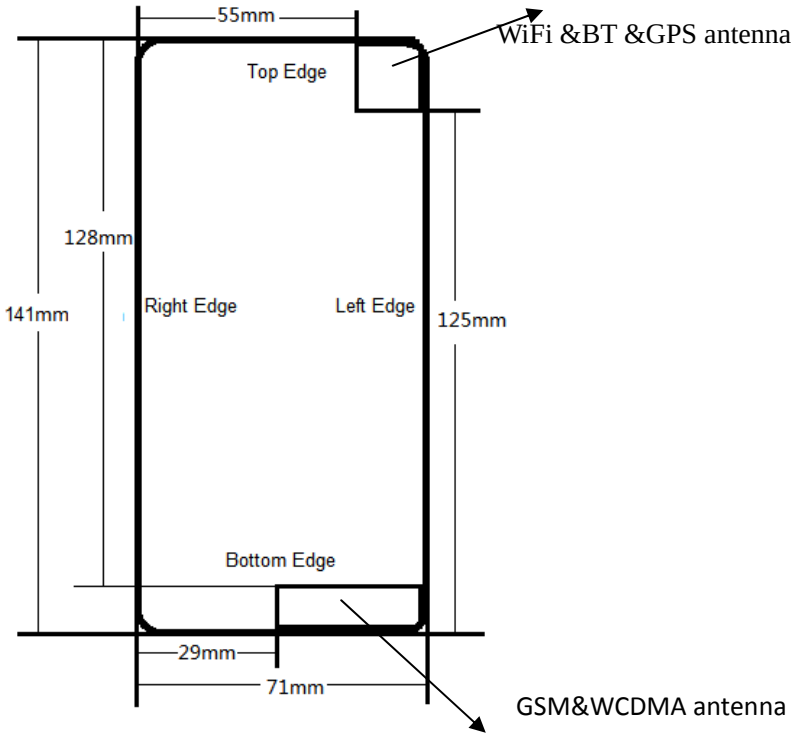
10 Measured and Reported (Scaled) SAR Results

10.1 EUT Antenna Locations



Overall (Length x Width): 141 mm x 71 mm Overall Diagonal: 151 mm/Display Diagonal: 127 mm						
Distance of the Antenna to the EUT surface/edge						
Antenna	Back Side	Front Side	Left Edge	Right Edge	Top Edge	Bottom Edge
Primary Antenna	0	0	0	29	128	0
BT/Wi-Fi Antenna	0	0	0	55	0	125
Hotspot mode, Positions for SAR tests						
Mode	Back Side	Front Side	Left Edge	Right Edge	Top Edge	Bottom Edge
GSM 850	Yes	Yes	Yes	N/A	N/A	Yes
GSM 1900	Yes	Yes	Yes	N/A	N/A	Yes
UMTS Band II	Yes	Yes	Yes	N/A	N/A	Yes
UMTS Band V	Yes	Yes	Yes	N/A	N/A	Yes
2.4GHz WLAN	Yes	Yes	Yes	N/A	Yes	N/A
Note: 1. Per KDB 941225 D06, 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 within 25mm from that surface or edge.						

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10.2 Measured SAR Results

Table 1: GSM 850

Test Position	Cover Type	Channel/ Frequency (MHz)	Time slot	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Figure No.
Head SAR											
Left Cheek	standard	190/836.6	GSM	1:8.3	33.00	32.28	-0.170	0.173	1.18	0.204	/
Left Tilt	standard	190/836.6	GSM	1:8.3	33.00	32.28	0.150	0.103	1.18	0.122	/
Right Cheek	standard	190/836.6	GSM	1:8.3	33.00	32.28	-0.170	0.181	1.18	0.214	Figure 9
Right Tilt	standard	190/836.6	GSM	1:8.3	33.00	32.28	-0.034	0.116	1.18	0.137	/
Body-worn (Distance 10mm)											
Back Side	standard	190/836.6	GSM	1:8.3	33.00	32.28	-0.002	0.391	1.18	0.462	Figure 10
Front Side	standard	190/836.6	GSM	1:8.3	33.00	32.28	-0.064	0.284	1.18	0.335	/
Hotspot(Distance 10mm)											
Back Side	standard	251/848.8	4Txslots	1:2.07	29	28.77	-0.028	0.766	1.05	0.808	Figure 11
		190/836.6	4Txslots	1:2.07	29	28.72	-0.040	0.693	1.07	0.739	/
		128/824.2	4Txslots	1:2.07	29	28.72	-0.060	0.715	1.07	0.763	/
Front Side	standard	190/836.6	4Txslots	1:2.07	29	28.72	-0.140	0.440	1.07	0.469	/
Left Edge	standard	190/836.6	4Txslots	1:2.07	29	28.72	0.050	0.225	1.07	0.240	/
Right Edge	standard	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top Edge	standard	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	190/836.6	4Txslots	1:2.07	29	28.72	0.120	0.157	1.07	0.167	/

Note: 1.The value with blue color is the maximum SAR Value of each test band.

3. When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.

4. Per FCC KDB Publication 648474 D04, SAR was evaluated without a headset connected to the device. Since the reported SAR was ≤ 1.2 W/kg, no additional SAR evaluations using a headset cable were required.

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Table 2: GSM 1900

Test Position	Cover Type	Channel/ Frequency (MHz)	Time slot	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Figure No.
Head SAR											
Left Cheek	standard	661/1880	GSM	1:8.3	29.50	28.99	-0.070	0.192	1.12	0.216	Figure 12
Left Tilt	standard	661/1880	GSM	1:8.3	29.50	28.99	0.190	0.052	1.12	0.059	/
Right Cheek	standard	661/1880	GSM	1:8.3	29.50	28.99	0.106	0.172	1.12	0.193	/
Right Tilt	standard	661/1880	GSM	1:8.3	29.50	28.99	0.030	0.054	1.12	0.060	/
Body-worn (Distance 10mm)											
Back Side	standard	661/1880	GSM	1:8.3	29.50	28.99	0.064	0.464	1.12	0.522	Figure 13
Front Side	standard	661/1880	GSM	1:8.3	29.50	28.99	0.085	0.346	1.12	0.389	/
Hotspot (Distance 10mm)											
Back Side	standard	810/1909.8	4Txslots	1:2.07	26	25.65	-0.030	1.150	1.08	1.247	/
		661/1880	4Txslots	1:2.07	26	25.61	0.050	1.060	1.09	1.160	/
		512/1850.2	4Txslots	1:2.07	26	25.49	0.050	0.687	1.12	0.773	/
Front Side	standard	810/1909.8	4Txslots	1:2.07	26	25.65	-0.025	0.938	1.08	1.017	/
		661/1880	4Txslots	1:2.07	26	25.61	0.080	0.833	1.09	0.911	/
		512/1850.2	4Txslots	1:2.07	26	25.49	0.140	0.567	1.12	0.638	/
Left Edge	standard	661/1880	4Txslots	1:2.07	26	25.61	-0.050	0.120	1.09	0.131	/
Right Edge	standard	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top Edge	standard	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	810/1909.8	4Txslots	1:2.07	26	25.65	-0.020	1.360	1.08	1.474	Figure 14
		661/1880	4Txslots	1:2.07	26	25.61	0.030	0.883	1.09	0.966	/
		512/1850.2	4Txslots	1:2.07	26	25.49	0.070	0.887	1.12	0.998	/
Back Side	Repeat	810/1909.8	4Txslots	1:2.07	26	25.65	-0.020	1.120	1.08	1.214	/
		661/1880	4Txslots	1:2.07	26	25.61	-0.012	1.033	1.09	1.130	/
Front Side	Repeat	810/1909.8	4Txslots	1:2.07	26	25.65	0.032	0.921	1.08	0.998	/
		661/1880	4Txslots	1:2.07	26	25.61	0.052	0.821	1.09	0.898	/
Bottom Edge	Repeat	810/1909.8	4Txslots	1:2.07	26	25.65	0.090	1.350	1.08	1.463	/
		661/1880	4Txslots	1:2.07	26	25.61	0.014	0.875	1.09	0.957	/
		512/1850.2	4Txslots	1:2.07	26	25.49	0.021	0.881	1.12	0.991	/

Note: 1.The value with blue color is the maximum SAR Value of each test band.

2. When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.

4. Per FCC KDB Publication 648474 D04, SAR was evaluated without a headset connected to the device. Since the reported SAR was ≤ 1.2 W/kg, no additional SAR evaluations using a headset cable were required.

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Measurement Variability				
Test Position	**Channel/ Frequency(MHz)**	**MAX Measured SAR_{1g} (W/kg)**	**1st Repeated SAR_{1g} (W/kg)**	**Ratio**
Back Side	810/1909.8	1.150	1.120	1.03
	661/1880	1.060	1.033	1.03
Front Side	810/1909.8	0.938	0.921	1.02
	661/1880	0.833	0.821	1.01
Bottom Edge	810/1909.8	1.360	1.350	1.01
	661/1880	0.883	0.875	1.01
	512/1850.2	0.887	0.881	1.01

Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.

2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).

3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

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Table 3: UMTS Band II

Test Position	Cover Type	Channel/ Frequency (MHz)	Channel Type	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Figure No.
Head SAR											
Left Cheek	standard	9400/1880	RMC 12.2K	1:1	22.50	21.90	0.170	0.339	1.15	0.389	Figure 15
Left Tilt	standard	9400/1880	RMC 12.2K	1:1	22.50	21.90	0.022	0.087	1.15	0.100	/
Right Cheek	standard	9400/1880	RMC 12.2K	1:1	22.50	21.90	0.075	0.324	1.15	0.372	/
Right Tilt	standard	9400/1880	RMC 12.2K	1:1	22.50	21.90	0.020	0.094	1.15	0.108	/
Body-worn & Hotspot (Distance 10mm)											
Back Side	standard	9538/1907.6	RMC 12.2K	1:1	22.50	22.30	-0.010	1.320	1.05	1.382	Figure 16
		9400/1880	RMC 12.2K	1:1	22.50	21.90	-0.029	1.010	1.15	1.160	/
		9262/1852.4	RMC 12.2K	1:1	22.50	22.27	0.010	1.180	1.05	1.244	/
Front Side	standard	9538/1907.6	RMC 12.2K	1:1	22.50	22.30	0.090	0.957	1.05	1.002	/
		9400/1880	RMC 12.2K	1:1	22.50	21.90	0.010	0.897	1.15	1.030	/
		9262/1852.4	RMC 12.2K	1:1	22.50	22.27	0.030	0.989	1.05	1.043	/
Back Side	Earphone	9538/1907.6	RMC 12.2K	1:1	22.50	22.30	0.020	1.260	1.05	1.319	/
Back Side	Repeat	9538/1907.6	RMC 12.2K	1:1	22.50	22.30	0.023	1.312	1.05	1.374	/
		9400/1880	RMC 12.2K	1:1	22.50	21.90	-0.025	1.011	1.15	1.161	/
		9262/1852.4	RMC 12.2K	1:1	22.50	22.27	0.014	1.175	1.05	1.239	/
Front Side	Repeat	9538/1907.6	RMC 12.2K	1:1	22.50	22.30	0.023	0.955	1.05	1.000	/
		9400/1880	RMC 12.2K	1:1	22.50	21.90	0.019	0.882	1.15	1.013	/
		9262/1852.4	RMC 12.2K	1:1	22.50	22.27	-0.023	0.981	1.05	1.034	/
Hotspot (Distance 10mm)											
Left Edge	standard	9400/1880	RMC 12.2K	1:1	22.50	21.90	0.170	0.153	1.15	0.176	/
Right Edge	standard	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top Edge	standard	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	9538/1907.6	RMC 12.2K	1:1	22.50	22.30	-0.060	1.410	1.05	1.476	Figure 17
		9400/1880	RMC 12.2K	1:1	22.50	21.90	-0.066	1.210	1.15	1.389	/
		9262/1852.4	RMC 12.2K	1:1	22.50	22.27	-0.080	1.360	1.05	1.434	/
Bottom Edge	Repeat	9538/1907.6	RMC 12.2K	1:1	22.50	22.30	0.170	1.370	1.05	1.435	/
		9400/1880	RMC 12.2K	1:1	22.50	21.90	-0.024	1.206	1.15	1.385	/
		9262/1852.4	RMC 12.2K	1:1	22.50	22.27	-0.011	1.351	1.05	1.424	/

Note: 1.The value with blue color is the maximum SAR Value of each test band.

2. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode

3. Per FCC KDB Publication 648474 D04, SAR was evaluated without a headset connected to the device. Since the reported SAR was ≤ 1.2 W/kg, no additional SAR evaluations using a headset cable were required.

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Measurement Variability				
Test Position	**Channel/ Frequency(MHz)**	**MAX Measured SAR_{1g} (W/kg)**	**1st Repeated SAR_{1g} (W/kg)**	**Ratio**
Back Side	9538/1907.6	1.320	1.312	1.01
	9400/1880	1.010	1.011	1.00
	9262/1852.4	1.180	1.175	1.00
Front Side	9538/1907.6	0.957	0.955	1.00
	9400/1880	0.897	0.882	1.02
	9262/1852.4	0.989	0.981	1.01
Bottom Edge	9538/1907.6	1.410	1.370	1.03
	9400/1880	1.210	1.206	1.00
	9262/1852.4	1.360	1.351	1.01

Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.

2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).

3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

Table 4: 3G SAR Test Reduction Procedure [UMTS Band II (WCDMA/HSDPA/HSUPA)]

Test Position	Channel/ Frequency (MHz)	The highest reported SAR of primary mode	The maximum Allowed Power of primary mode (dBm)	The maximum Allowed Power of secondary mode (dBm)	Scaling Factor	The adjusted SAR
HSDPA						
Bottom Edge	9262/1852.4	1.476	22.5	21.5	1.259	1.172
HSUPA						
Bottom Edge	9262/1852.4	1.476	22.5	21.0	1.412	1.045

When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode

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Table 5: UMTS Band V

Test Position	Cover Type	Channel/ Frequency (MHz)	Channel Type	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Figure No.
Head SAR											
Left Cheek	standard	4183/836.6	RMC 12.2K	1:1	23.00	22.48	0.050	0.120	1.13	0.135	/
Left Tilt	standard	4183/836.6	RMC 12.2K	1:1	23.00	22.48	0.025	0.072	1.13	0.081	/
Right Cheek	standard	4183/836.6	RMC 12.2K	1:1	23.00	22.48	0.180	0.123	1.13	0.139	Figure 18
Right Tilt	standard	4183/836.6	RMC 12.2K	1:1	23.00	22.48	0.032	0.070	1.13	0.079	/
Body-worn & Hotspot (Distance 10mm)											
Back Side	standard	4183/836.6	RMC 12.2K	1:1	23.00	22.48	0.040	0.292	1.13	0.329	Figure 19
Front Side	standard	4183/836.6	RMC 12.2K	1:1	23.00	22.48	0.060	0.190	1.13	0.214	/
Hotspot (Distance 10mm)											
Left Edge	standard	4183/836.6	RMC 12.2K	1:1	23.00	22.48	-0.040	0.082	1.13	0.092	/
Right Edge	standard	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top Edge	standard	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	4183/836.6	RMC 12.2K	1:1	23.00	22.48	0.100	0.065	1.13	0.073	/

Note: 1.The value with blue color is the maximum SAR Value of each test band.

2. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode

3. Per FCC KDB Publication 648474 D04, SAR was evaluated without a headset connected to the device. Since the reported SAR was ≤ 1.2 W/kg, no additional SAR evaluations using a headset cable were required.

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Table 6: Wi-Fi

Test Position	Cover Type	Channel/ Frequency (MHz)	Mode 802.11b	Duty Cycle	Area Scan Max.SAR (W/Kg)	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Figure No.
Head SAR												
Left Cheek	standard	6/2437	DSSS	1:1	0.247	15	14.05	-0.110	0.253	1.24	0.315	/
Left Tilt	standard	6/2437	DSSS	1:1	0.184	15	14.05	0.080	0.204	1.24	0.254	/
Right Cheek	standard	6/2437	DSSS	1:1	0.479	15	14.05	0.070	0.552	1.24	0.687	Figure 20
Right Tilt	standard	6/2437	DSSS	1:1	0.297	15	14.05	0.040	0.372	1.24	0.463	/
Body-worn & Hotspot (Distance 10mm)												
Back Side	standard	6/2437	DSSS	1:1	0.126	15	14.05	-0.190	0.131	1.24	0.163	Figure 21
Front Side	standard	6/2437	DSSS	1:1	0.118	15	14.05	0.130	0.118	1.24	0.147	/
Hotspot (Distance 10mm)												
Left Edge	standard	6/2437	DSSS	1:1	0.0768	15	14.05	0.035	0.080	1.24	0.100	/
Right Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top Edge	standard	6/2437	DSSS	1:1	0.0455	15	14.05	0.043	0.052	1.24	0.065	/
Bottom Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: 1. The value with blue color is the maximum SAR Value of each test band.

Table 7: Bluetooth

Band	Configuration	Frequency (MHz)	Maximum Power (dBm)	Separation Distance (mm)	Estimated SAR (W/kg)
Bluetooth	head	2480	2	5	0.066
Bluetooth	Body	2480	2	10	0.033

For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01 based on the formula below.

(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√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.

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10.3 Simultaneous Transmission Analysis

Simultaneous Transmission Configurations	Head	Body-worn	Hotspot	Extremity
GSM(Voice) + Wi-Fi-2.4GHz(data)	Yes	Yes	NA	NA
GSM(Voice) + Bluetooth(data)	Yes	Yes	NA	NA
WCDMA(Voice) + Wi-Fi-2.4GHz(data)	Yes	Yes	NA	NA
WCDMA(Voice) + Bluetooth(data)	Yes	Yes	NA	NA
GPRS/EDGE(Data) + Wi-Fi-2.4GHz(data)	NA	Yes	Yes	NA
GPRS/EDGE(Data) + Bluetooth(data)	NA	Yes	Yes	NA
WCDMA(Data) + Wi-Fi-2.4GHz(data)	NA	Yes	Yes	NA
WCDMA(Data) + Bluetooth(data)	NA	Yes	Yes	NA
Wi-Fi-2.4GHz(data) + Bluetooth(data)	NA	NA	NA	NA

General Note:

1. The Scaled SAR summation is calculated based on the same configuration and test position.
2. Per KDB 447498 D01v05r02, simultaneous transmission SAR is compliant if,

   i) Scalar SAR summation < 1.6W/kg.

   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.

   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.

iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.

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About BT and GSM/UMTS Antenna

Head & Body-worn

SAR_{1g} (W/kg) / Test Position	GSM 850	GSM 1900	UMTS Band II	UMTS Band V	BT	MAX. ΣSAR_{1g}	SPLSR
Left, Touch	0.204	0.216	**0.389**	0.135	**0.066**	0..455	NA
Left, Tilt	**0.122**	0.059	0.100	0.081	**0.066**	0.188	NA
Right, Touch	0.214	0.193	**0.372**	0.139	**0.066**	0.438	NA
Right, Tilt	**0.137**	0.060	0.108	0.079	**0.066**	0.203	NA
Back Side	0.462	0.522	**1.382**	0.329	**0.033**	1.415	NA
Front Side	0.335	0.389	**1.043**	0.214	**0.033**	1.076	NA

Note: 1.The value with blue color is the maximum ΣSAR1g Value.

2. MAX. ΣSAR_{1g} =Unlicensed SAR_{MAX} +Licensed SAR_{MAX}

Hotspot

SAR_{1g} (W/kg) / Test Position	GSM 850	GSM 1900	UMTS Band II	UMTS Band V	BT	MAX. ΣSAR_{1g}	SPLSR
Back Side	0.808	1.247	**1.382**	0.329	**0.033**	1.415	NA
Front Side	0.469	1.017	**1.043**	0.214	**0.033**	1.076	NA
Left Edge	**0.240**	0.081	0.176	0.092	**0.033**	0.273	NA
Right Edge	N/A	N/A	N/A	N/A	**0.033**	0.033	NA
Top Edge	N/A	N/A	N/A	N/A	**0.033**	0.033	NA
Bottom Edge	0.167	1.474	**1.476**	0.073	**0.033**	1.509	NA

Note: 1.The value with blue color is the maximum ΣSAR1g Value.

2. MAX. ΣSAR_{1g} =Unlicensed SAR_{MAX} +Licensed SAR_{MAX}

MAX. ΣSAR_{1g} = 1.509 W/kg <1.6 W/kg, so the Simultaneous transimition SAR with volum scan are not required for BT and GSM/UMTS Antenna.

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About Wi-Fi and GSM/UMTS/LTE Antenna

Head & Body-worn

SAR_{1g} (W/kg) / Test Position	GSM 850	GSM 1900	UMTS Band II	UMTS Band V	Wi-Fi	MAX. ΣSAR_{1g}	SPLSR
Left, Touch	0.204	0.216	**0.389**	0.135	**0.315**	0.704	NA
Left, Tilt	**0.122**	0.059	0.100	0.081	**0.254**	0.376	NA
Right, Touch	0.214	0.193	**0.372**	0.139	**0.687**	1.059	NA
Right, Tilt	**0.137**	0.060	0.108	0.079	**0.463**	0.600	NA
Back Side (Voice)	0.462	0.522	**1.382**	0.329	**0.163**	1.545	NA
Front Side (Voice)	0.335	0.389	**1.120**	0.214	**0.147**	1.267	NA

Note: 1.The value with blue color is the maximum ΣSAR1g Value.

2. MAX. ΣSAR_{1g} =Unlicensed SAR_{MAX} +Licensed SAR_{MAX}

Hotspot

SAR_{1g} (W/kg) / Test Position	GSM 850	GSM 1900	UMTS Band II	UMTS Band V	Wi-Fi	MAX. ΣSAR_{1g}	SPLSR
Back Side (date)	0.808	1.247	**1.382**	0.329	**0.163**	1.545	NA
Front Side (date)	0.469	1.017	**1.120**	0.214	**0.147**	1.267	NA
Left Edge	**0.240**	0.081	0.176	0.092	**0.100**	0.340	NA
Right Edge	N/A	N/A	N/A	N/A	N/A	N/A	NA
Top Edge	N/A	N/A	N/A	N/A	**0.065**	0.065	NA
Bottom Edge	0.167	1.474	**1.476**	0.073	N/A	1.476	NA

Note: 1.The value with blue color is the maximum ΣSAR1g Value.

2. MAX. ΣSAR_{1g} =Unlicensed SAR_{MAX} +Licensed SAR_{MAX}

MAX. ΣSAR_{1g} = 1.545 W/kg <1.6 W/kg, so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi and GSM/UMTS/LTE Antenna.

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5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528- 2013 is not required in SAR reports submitted for equipment approval.

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ANNEX A: Test Layout

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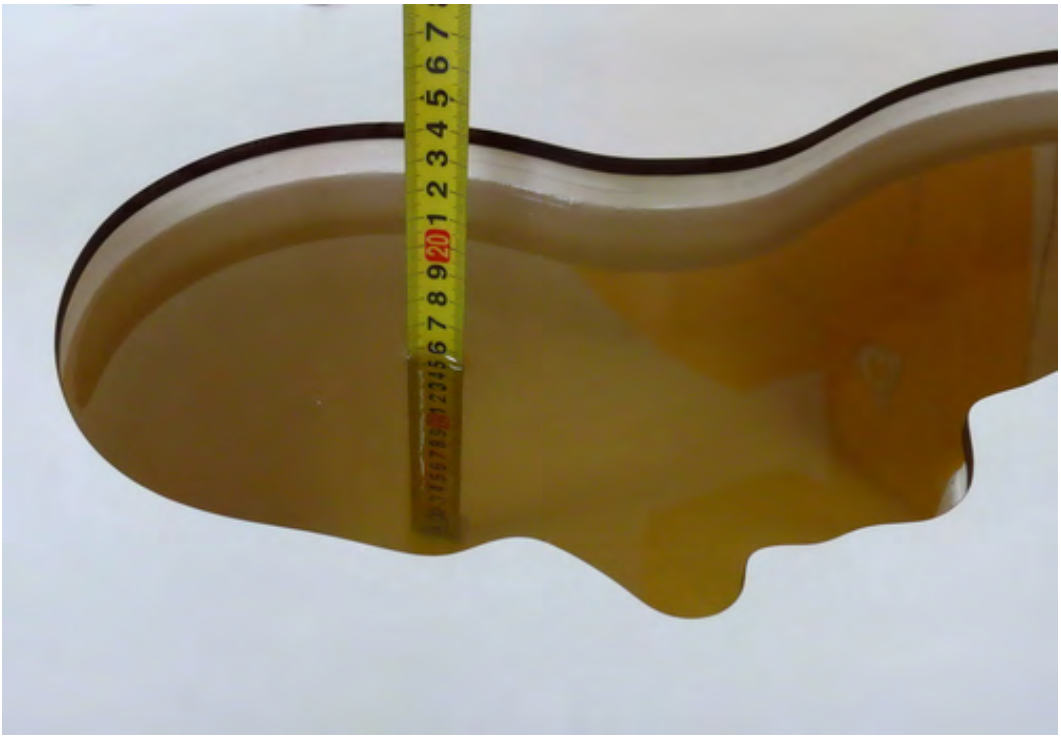
Picture 3: Liquid depth in the flat Phantom (835MHz, 15.4cm depth)



Picture 4: Liquid depth in the head Phantom (835MHz, 15.3cm depth)

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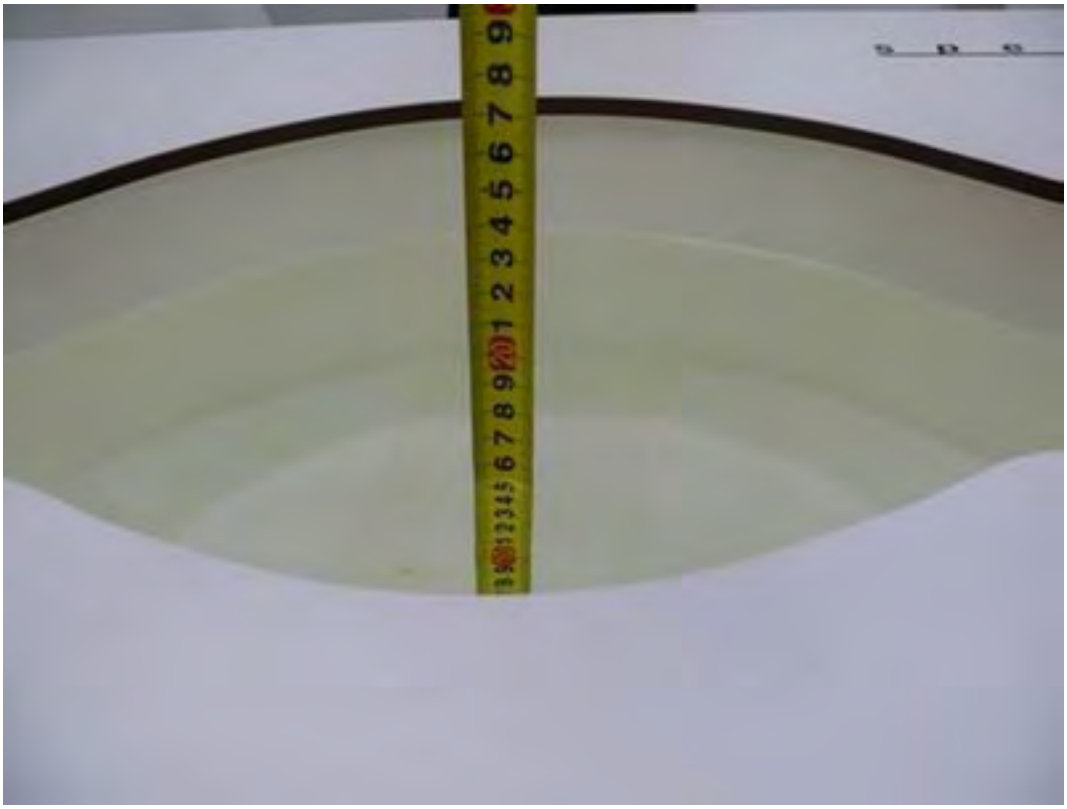

Picture 5: Liquid depth in the flat Phantom (1900 MHz**,** 15.2cm depth)

Picture 6: liquid depth in the head Phantom (1900 MHz, 15.3cm depth)

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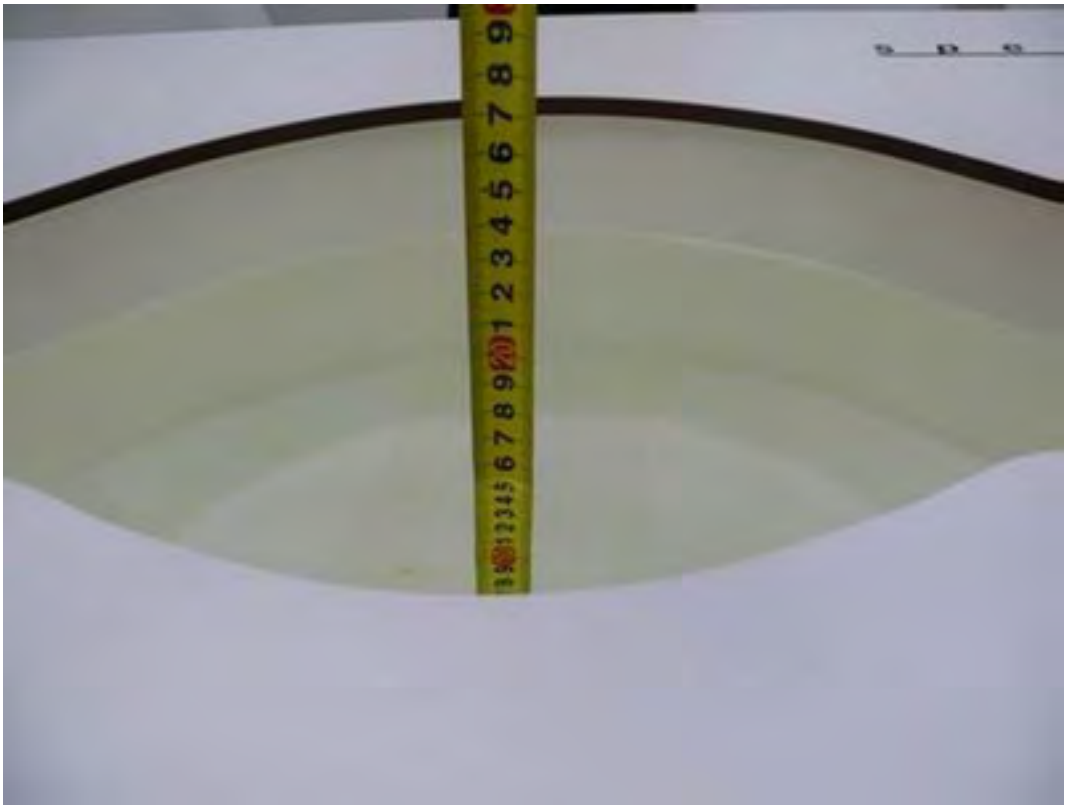

Picture 7: Liquid depth in the flat Phantom (2450 MHz, 15.3cm depth)

Picture 8: Liquid depth in the head Phantom (2450 MHz, 15.4cm depth)

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ANNEX B: System Check Results

System Performance Check at 835 MHz Head TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

Date: 12/14/2015

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.88 mho/m; ε_r = 41.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.30, 9.30, 9.30); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=15mm, Pin=250mW/Area Scan (41x121x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 2.64 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.4 V/m; Power Drift = -0.076 dB

Peak SAR (extrapolated) = 3.67 W/kg

SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.6 mW/g

Maximum value of SAR (measured) = 2.64 mW/g

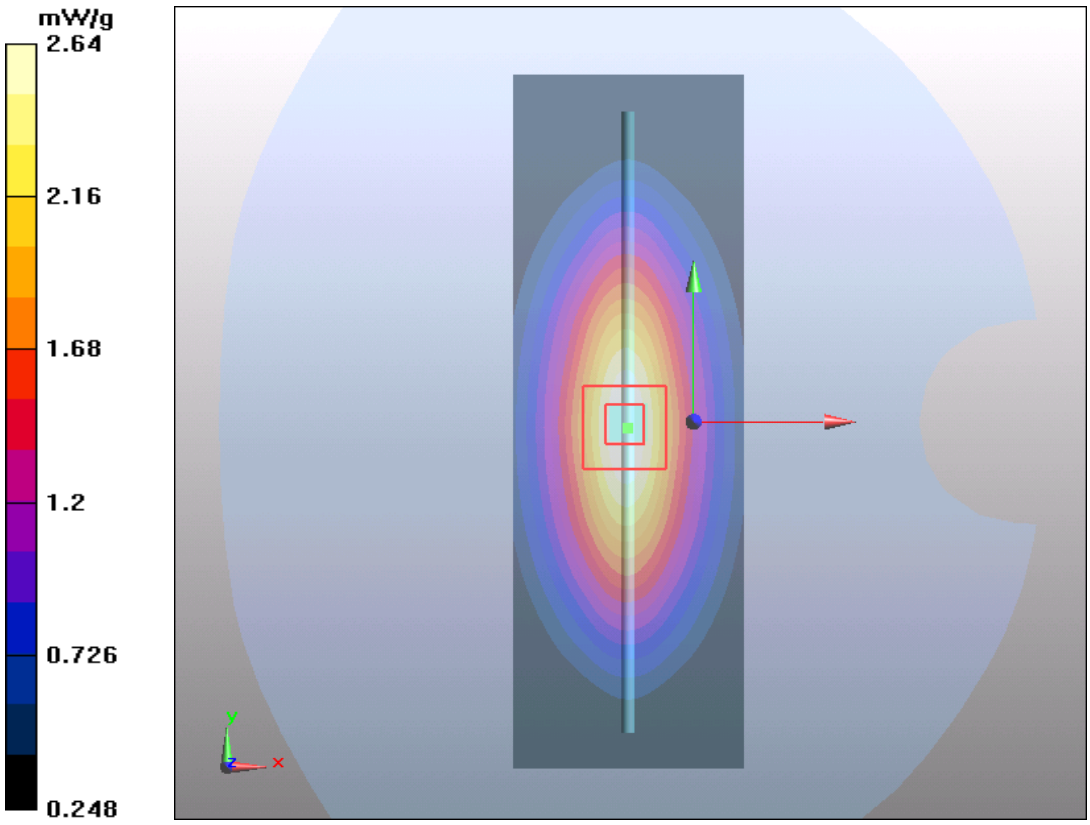

Figure 1 System Performance Check 835MHz 250mW

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System Performance Check at 835 MHz Body TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

Date: 12/14/2015

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.96 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.45, 9.45, 9.45); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=15mm, Pin=250mW/Area Scan (41x121x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 2.58 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 51.9 V/m; Power Drift = -0.058 dB

Peak SAR (extrapolated) = 3.5 W/kg

SAR(1 g) = 2.41 mW/g; SAR(10 g) = 1.6 mW/g

Maximum value of SAR (measured) = 2.6 mW/g

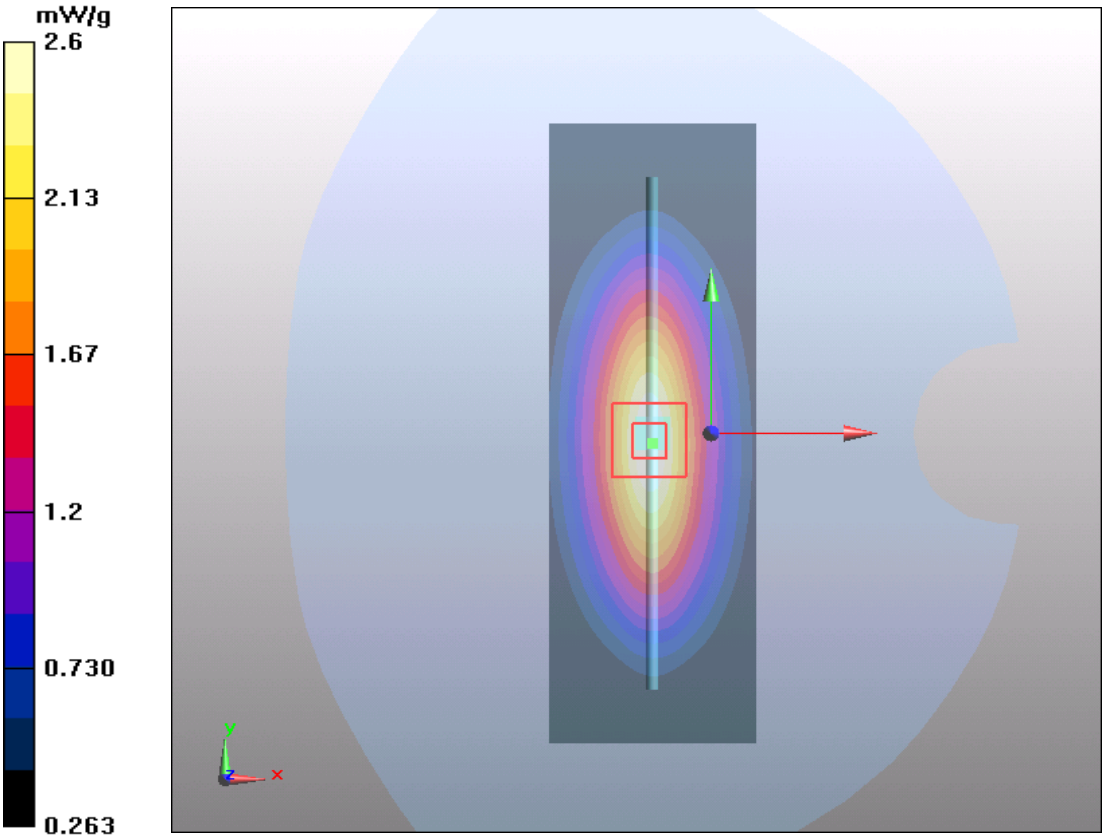

Figure 2 System Performance Check 835MHz 250mW

This report shall not be reproduced except in full, without the written approval of TA Technology (Shanghai) Co., Ltd.

System Performance Check at 835 MHz Body TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

Date: 12/30/2015

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.95 mho/m; ε_r = 54.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.45, 9.45, 9.45); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=15mm, Pin=250mW/Area Scan (41x121x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 2.61 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 52.09 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 3.48 W/kg

SAR(1 g) = 2.46 mW/g; SAR(10 g) = 1.67 mW/g

Maximum value of SAR (measured) = 2.73 mW/g

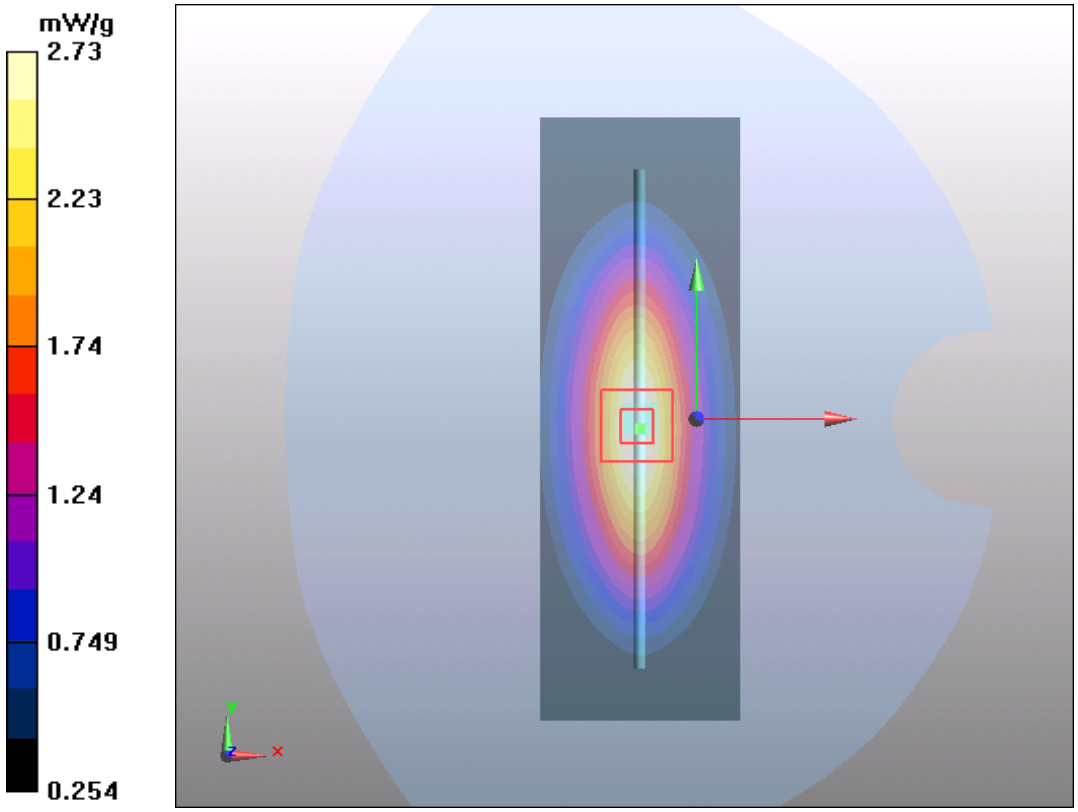

Figure 3 System Performance Check 835MHz 250mW

This report shall not be reproduced except in full, without the written approval of TA Technology (Shanghai) Co., Ltd.

System Performance Check at 1900 MHz Head TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Date: 12/15/2015

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.41 mho/m; ε_r = 40.7; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.94, 7.94, 7.94); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 11.3 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 85.5 V/m; Power Drift = 0.028 dB

Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 9.48 mW/g; SAR(10 g) = 4.9 mW/g

Maximum value of SAR (measured) = 10.7 mW/g

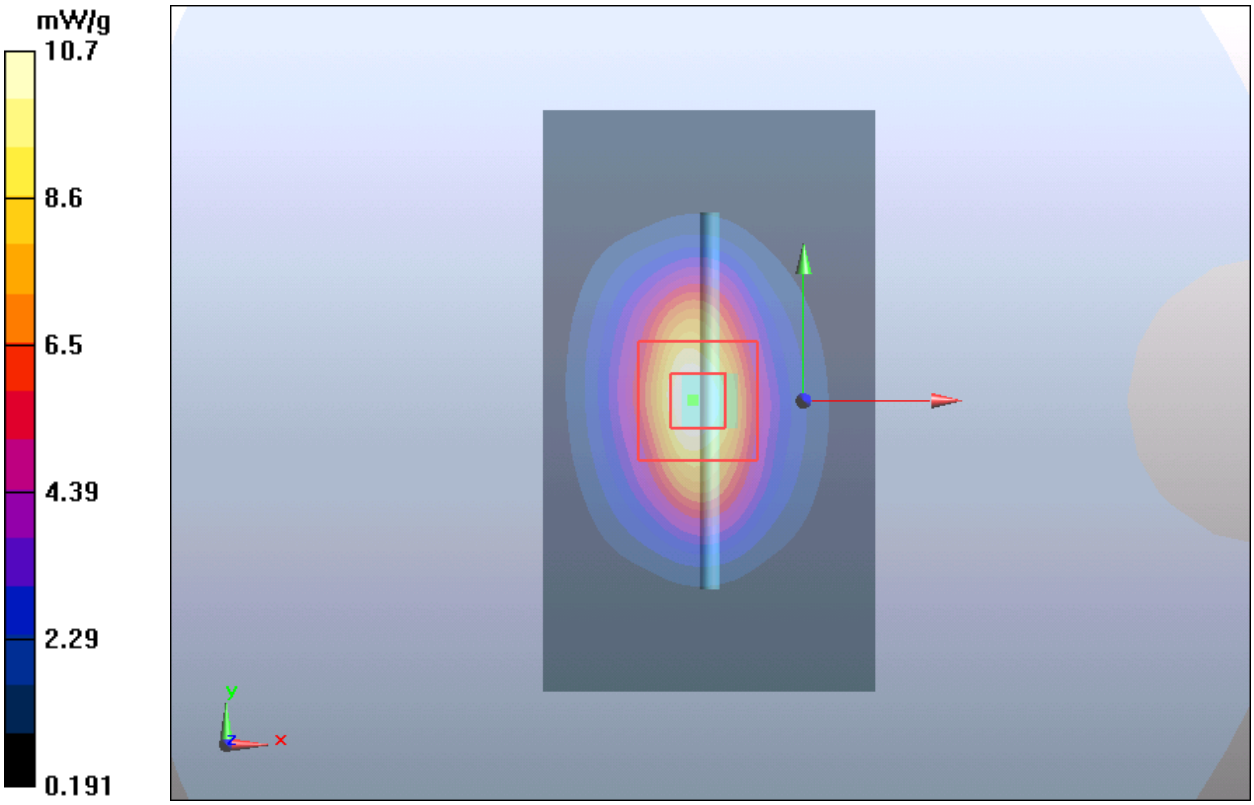

Figure 4 System Performance Check 1900MHz 250mW

This report shall not be reproduced except in full, without the written approval of TA Technology (Shanghai) Co., Ltd.

System Performance Check at 1900 MHz Body TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Date: 12/15/2015

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.51mho/m; ε_r = 52.6; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 12.2 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 82.3 V/m; Power Drift = 0.068 dB

Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 9.93 mW/g; SAR(10 g) = 5.25 mW/g

Maximum value of SAR (measured) = 11.3 mW/g

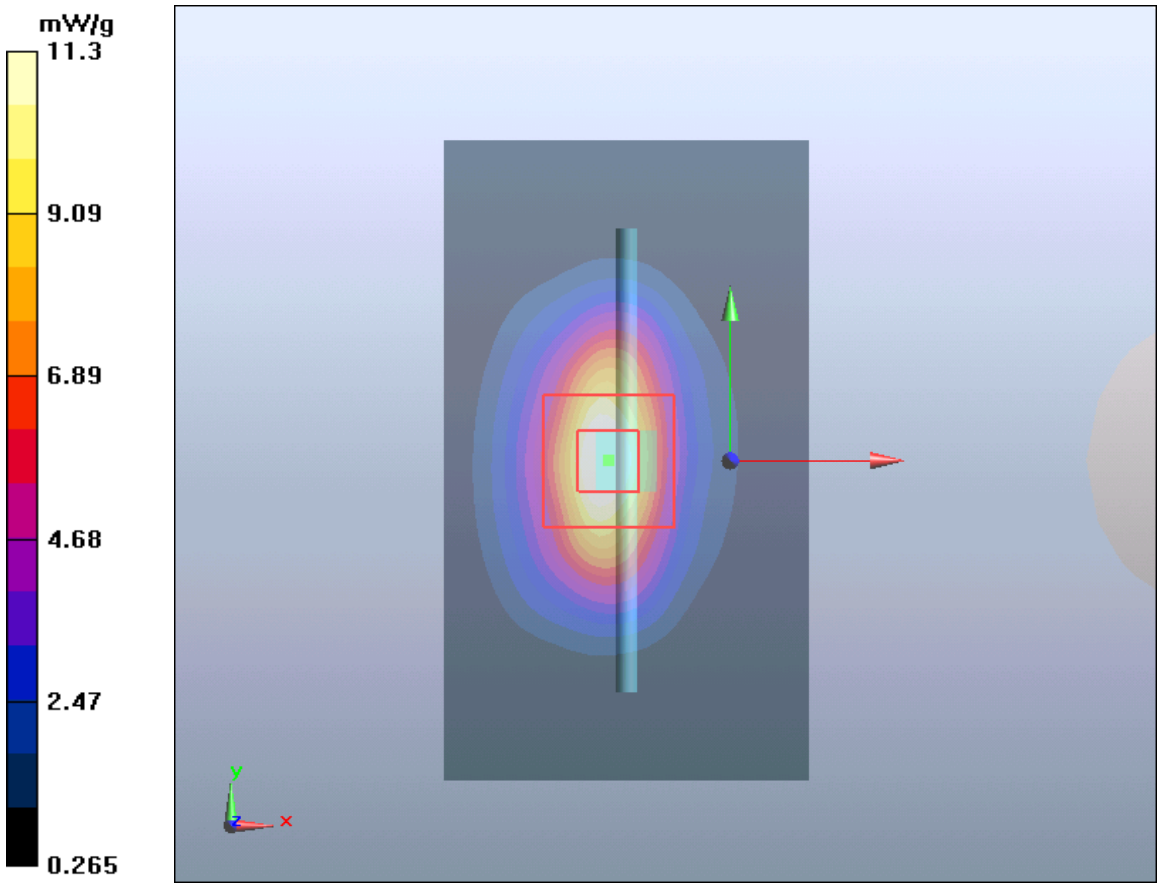

Figure 5 System Performance Check 1900MHz 250mW

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System Performance Check at 1900 MHz Body TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Date: 12/30/2015

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.53mho/m; ε_r = 52.5; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 11.9 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 80.8 V/m; Power Drift = -0.063 dB

Peak SAR (extrapolated) = 17.6 W/kg

SAR(1 g) = 9.82 mW/g; SAR(10 g) = 5.2 mW/g

Maximum value of SAR (measured) = 11 mW/g

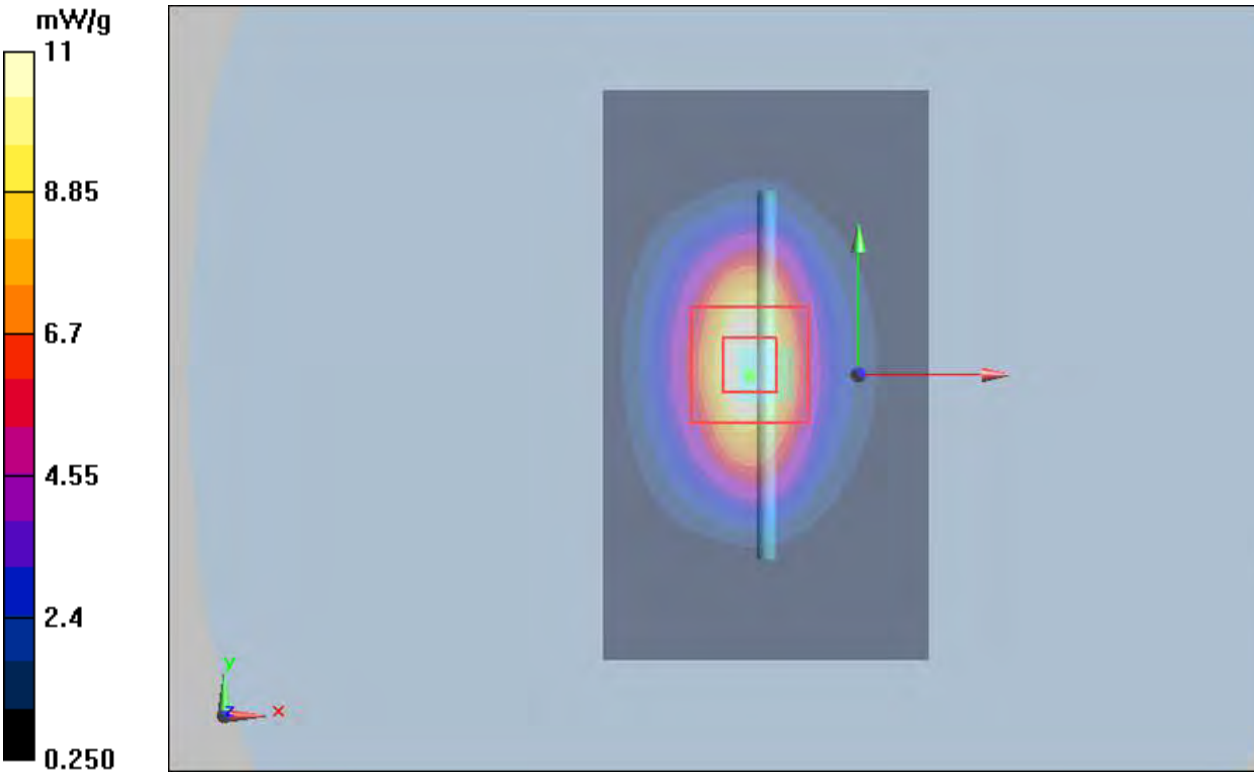

Figure 6 System Performance Check 1900MHz 250mW

This report shall not be reproduced except in full, without the written approval of TA Technology (Shanghai) Co., Ltd.

System Performance Check at 2450 MHz Head TSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

Date: 12/16/2015

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; σ = 1.81 mho/m; ε_r = 38.6; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.22, 7.22, 7.22); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 18.2 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 88.8 V/m; Power Drift = 0.075 dB

Peak SAR (extrapolated) = 30 W/kg

SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.22 mW/g

Maximum value of SAR (measured) = 15.9 mW/g

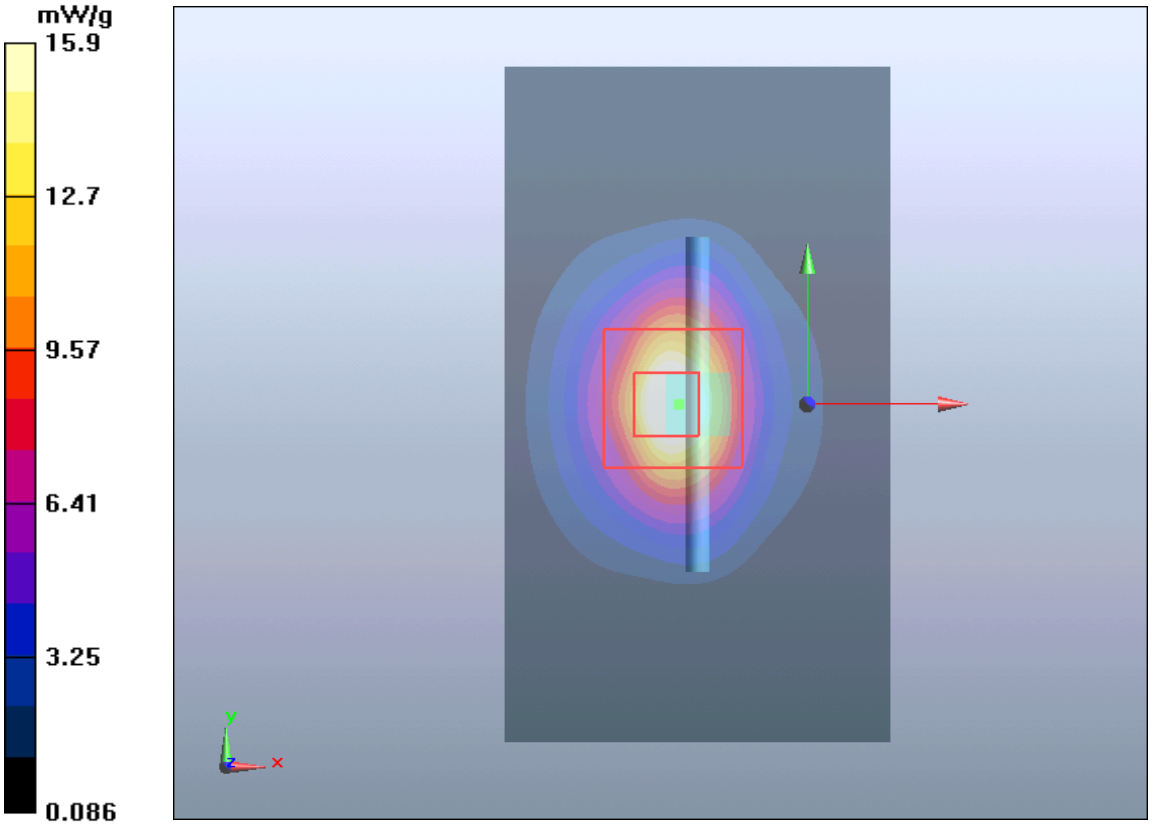

Figure 7 System Performance Check 2450MHz 250mW

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System Performance Check at 2450 MHz Body TSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

Date: 12/16/2015

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; σ = 1.98 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.42, 7.42, 7.42); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 16 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 81.2 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 25.4 W/kg

SAR(1 g) = 12.5 mW/g; SAR(10 g) = 6.20 mW/g

Maximum value of SAR (measured) = 14.4 mW/g

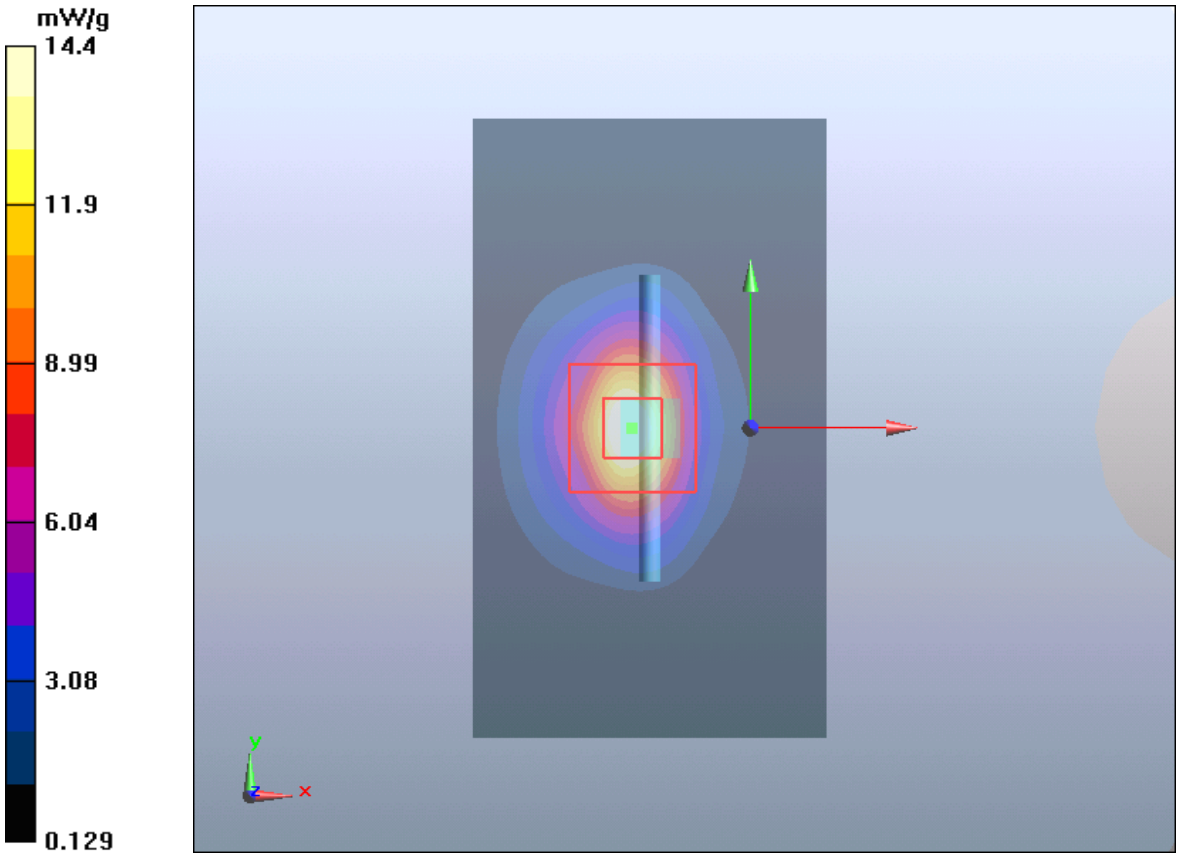

Figure 8 System Performance Check 2450MHz 250mW

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ANNEX C: Highest Graph Results

GSM 850 Right Cheek Middle

Date: 12/14/2015

Communication System: UID 0, GSM (0); Frequency: 836.6 MHz;Duty Cycle: 1:8.30042

Medium parameters used: f = 837 MHz; σ = 0.885 S/m; ε_r = 41.372; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Right Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.30, 9.30, 9.30); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Right Cheek Middle/Area Scan (71x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.189 W/kg

Right Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.301 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 0.214 W/kg

SAR(1 g) = 0.181 W/kg; SAR(10 g) = 0.141 W/kg

Maximum value of SAR (measured) = 0.189 W/kg

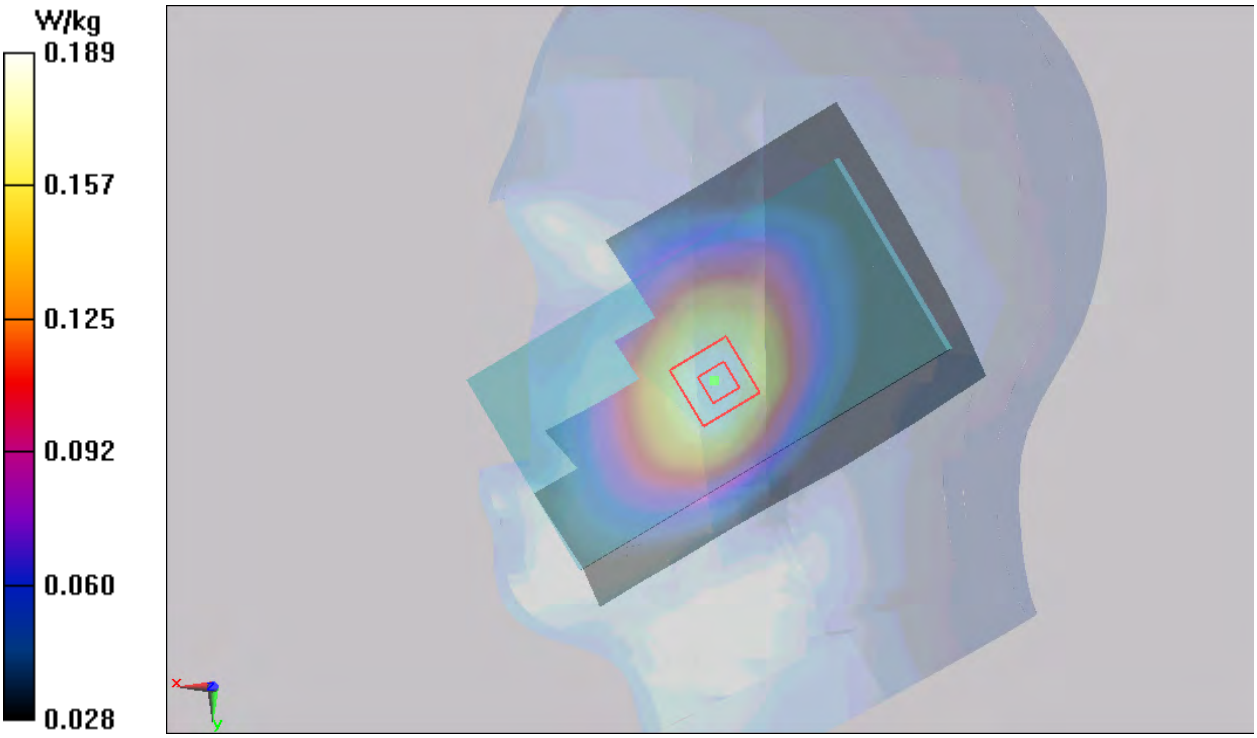

Figure 9 Right Hand Touch Cheek GSM 850 Channel 190

This report shall not be reproduced except in full, without the written approval of TA Technology (Shanghai) Co., Ltd.

GSM 850 Back Side Middle

Date: 12/30/2015

Communication System: GSM850; Frequency: 836.6 MHz;Duty Cycle: 1:8.30042

Medium parameters used: f = 837 MHz; σ = 0.967 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.45, 9.45, 9.45); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (71x121x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.409 mW/g

Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.5 V/m; Power Drift = -0.002 dB

Peak SAR (extrapolated) = 0.480 W/kg

SAR(1 g) = 0.391 mW/g; SAR(10 g) = 0.300 mW/g

Maximum value of SAR (measured) = 0.410 mW/g

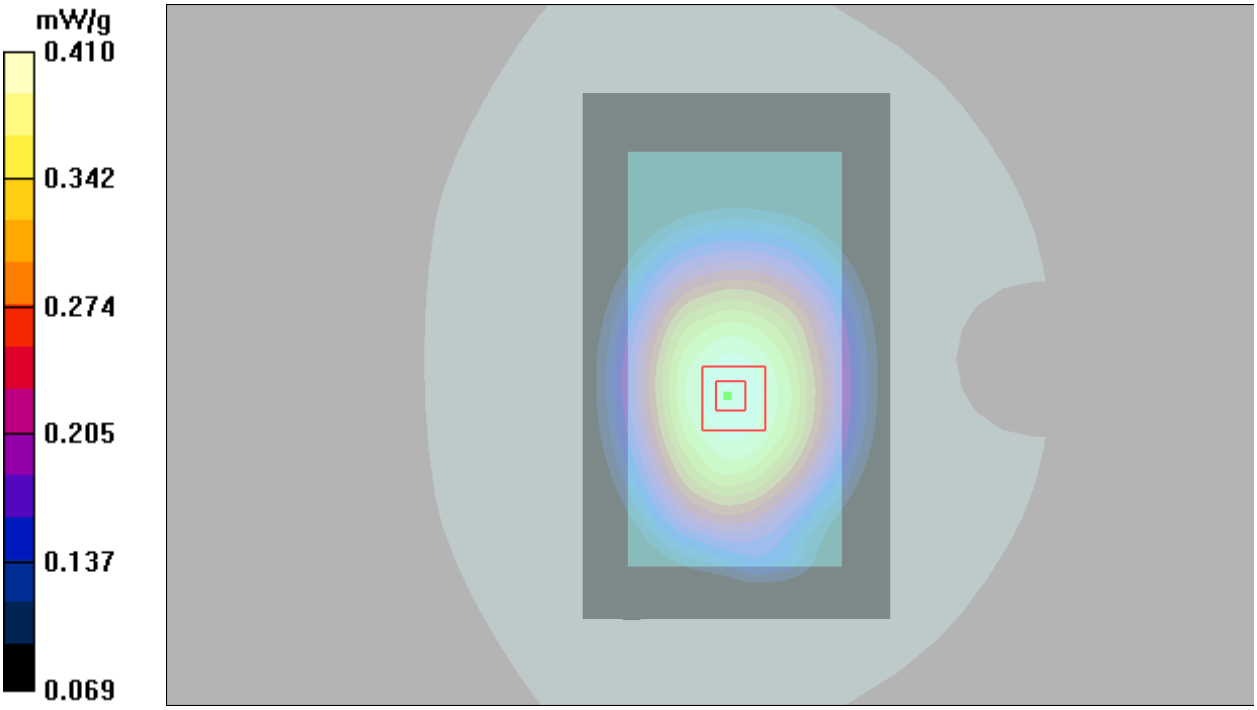

Figure 10 Body, Back Side, GSM 850 GSM Channel 190

This report shall not be reproduced except in full, without the written approval of TA Technology (Shanghai) Co., Ltd.

GSM 850 GPRS (4Txslots) Back Side High

Date: 12/14/2015

Communication System: UID 0, GPRS 4TX (0); Frequency: 848.8 MHz;Duty Cycle: 1:2.07491

Medium parameters used: f = 849 MHz; σ = 0.978 S/m; ε_r = 54.037; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.45, 9.45, 9.45); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side High/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.810 W/kg

Back Side High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 30.13 V/m; Power Drift = -0.028 dB

Peak SAR (extrapolated) = 0.940 W/kg

SAR(1 g) = 0.766 W/kg; SAR(10 g) = 0.587 W/kg

Maximum value of SAR (measured) = 0.802 W/kg

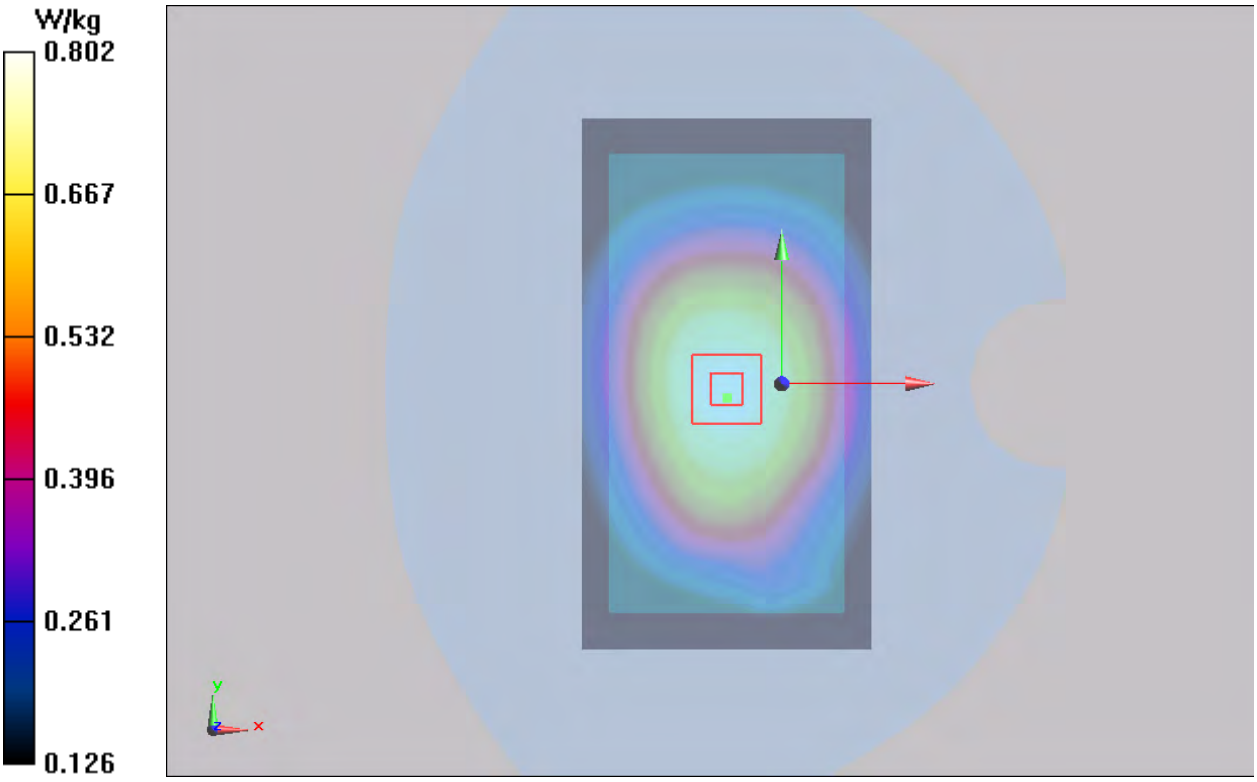

Figure 11 Body, Back Side, GSM 850 GPRS (4Txslots) Channel 251

This report shall not be reproduced except in full, without the written approval of TA Technology (Shanghai) Co., Ltd.

GSM 1900 Left Cheek Middle

Date: 12/15/2015

Communication System: UID 0, GSM (0); Frequency: 1880 MHz;Duty Cycle: 1:8.30042

Medium parameters used: f = 1880 MHz; σ = 1.386 S/m; ε_r = 40.8; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.94, 7.94, 7.94); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek Middle/Area Scan (71x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.216 W/kg

Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.366 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.304 W/kg

SAR(1 g) = 0.192 W/kg; SAR(10 g) = 0.117 W/kg

Maximum value of SAR (measured) = 0.210 W/kg

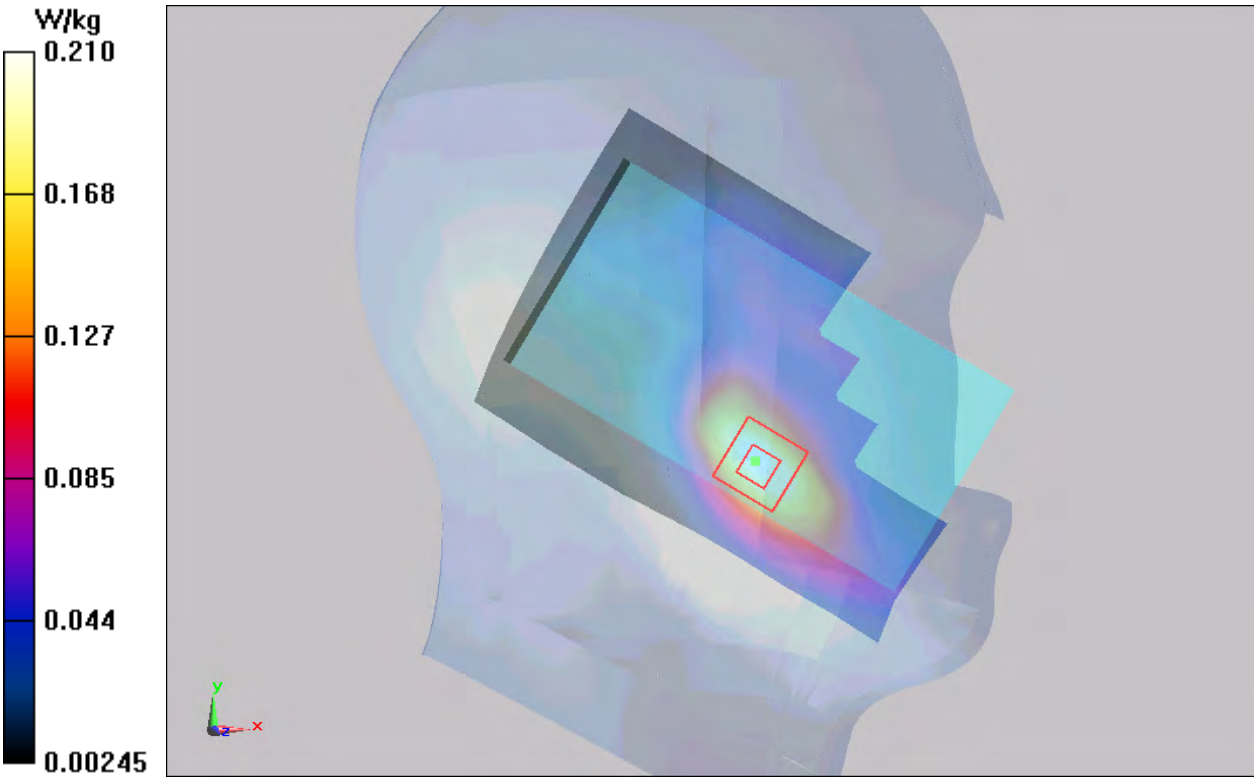

Figure 12 Left Hand Touch Cheek GSM 1900 Channel 661

This report shall not be reproduced except in full, without the written approval of TA Technology (Shanghai) Co., Ltd.

GSM 1900 Back Side Middle

Date: 12/30/2015

Communication System: PCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.30042

Medium parameters used: f = 1880 MHz; σ = 1.49 mho/m; ε_r = 52.6; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (71x121x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.499 mW/g

Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.31 V/m; Power Drift = 0.0639 dB

Peak SAR (extrapolated) = 0.782 W/kg

SAR(1 g) = 0.464 mW/g; SAR(10 g) = 0.253 mW/g

Maximum value of SAR (measured) = 0.524 mW/g

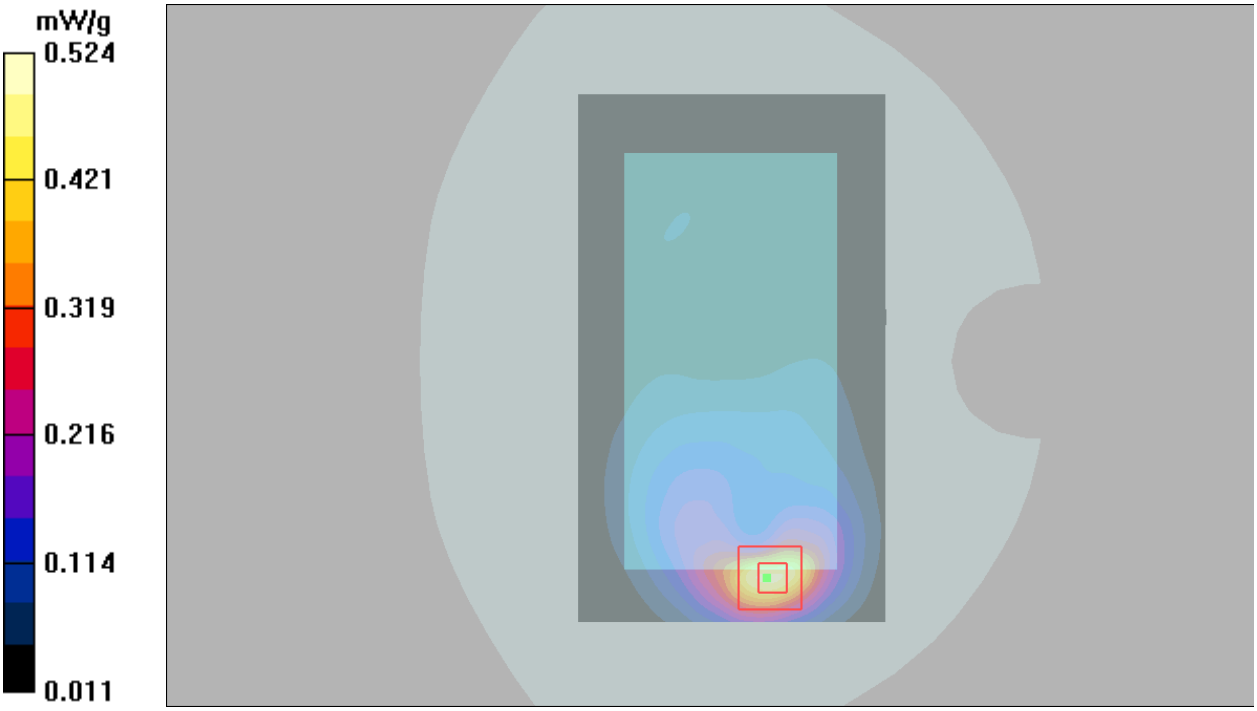

Figure 13 Body, Back Side, GSM 1900 GSM Channel 661

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GSM 1900 GPRS (4Txslots) Bottom Edge High

Date: 12/15/2015

Communication System: UID 0, GPRS 4TX (0); Frequency: 1909.8 MHz;Duty Cycle: 1:2.07491

Medium parameters used: f = 1910 MHz; σ = 1.525 S/m; ε_r = 52.593; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Bottom Side High/Area Scan (51x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.52 W/kg

Bottom Side High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 29.63 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 2.31 W/kg

SAR(1 g) = 1.36 W/kg; SAR(10 g) = 0.708 W/kg

Maximum value of SAR (measured) = 1.49 W/kg

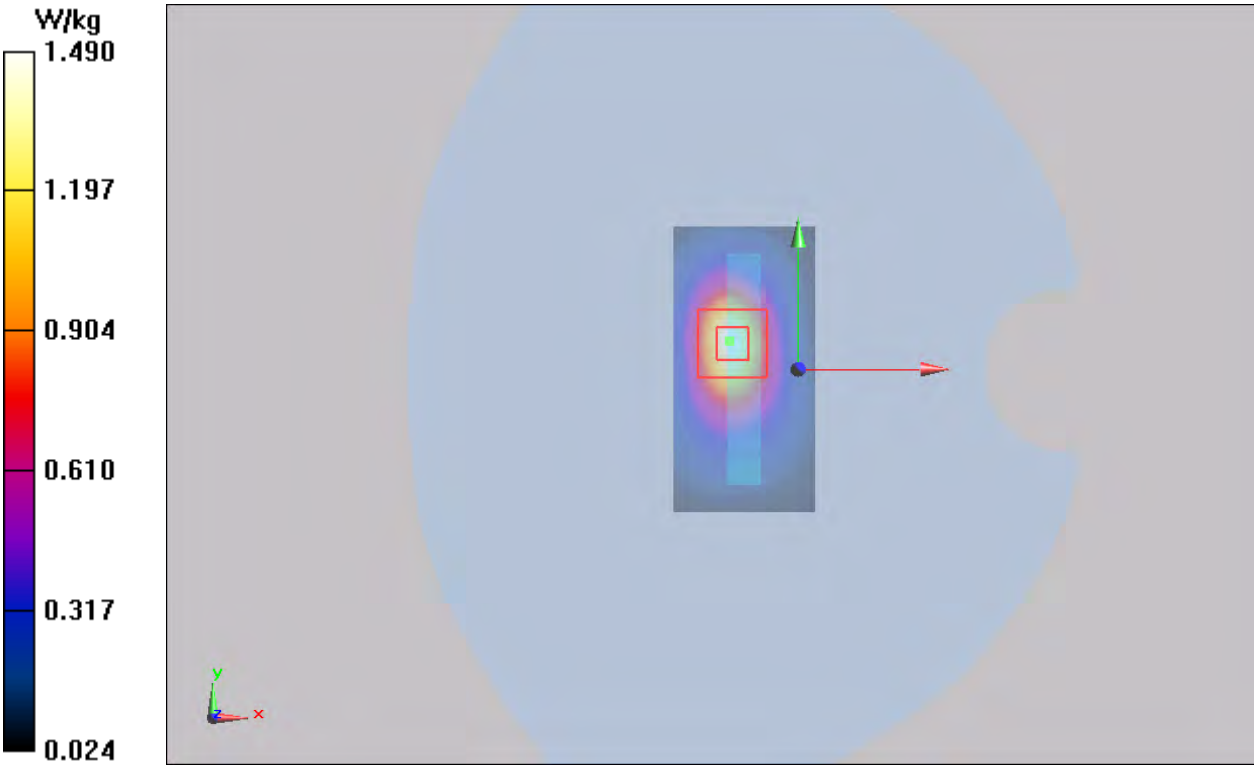

Figure 14 Body, Bottom Edge, GSM 1900 GPRS (4Txslots) Channel 810

This report shall not be reproduced except in full, without the written approval of TA Technology (Shanghai) Co., Ltd.

UMTS Band II Left Cheek Middle

Date: 12/15/2015

Communication System: UID 0, WCDMA (0); Frequency: 1880 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1880 MHz; σ = 1.386 S/m; ε_r = 40.8; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.94, 7.94, 7.94); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek Middle/Area Scan (71x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.378 W/kg

Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.690 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 0.526 W/kg

SAR(1 g) = 0.339 W/kg; SAR(10 g) = 0.209 W/kg

Maximum value of SAR (measured) = 0.364 W/kg

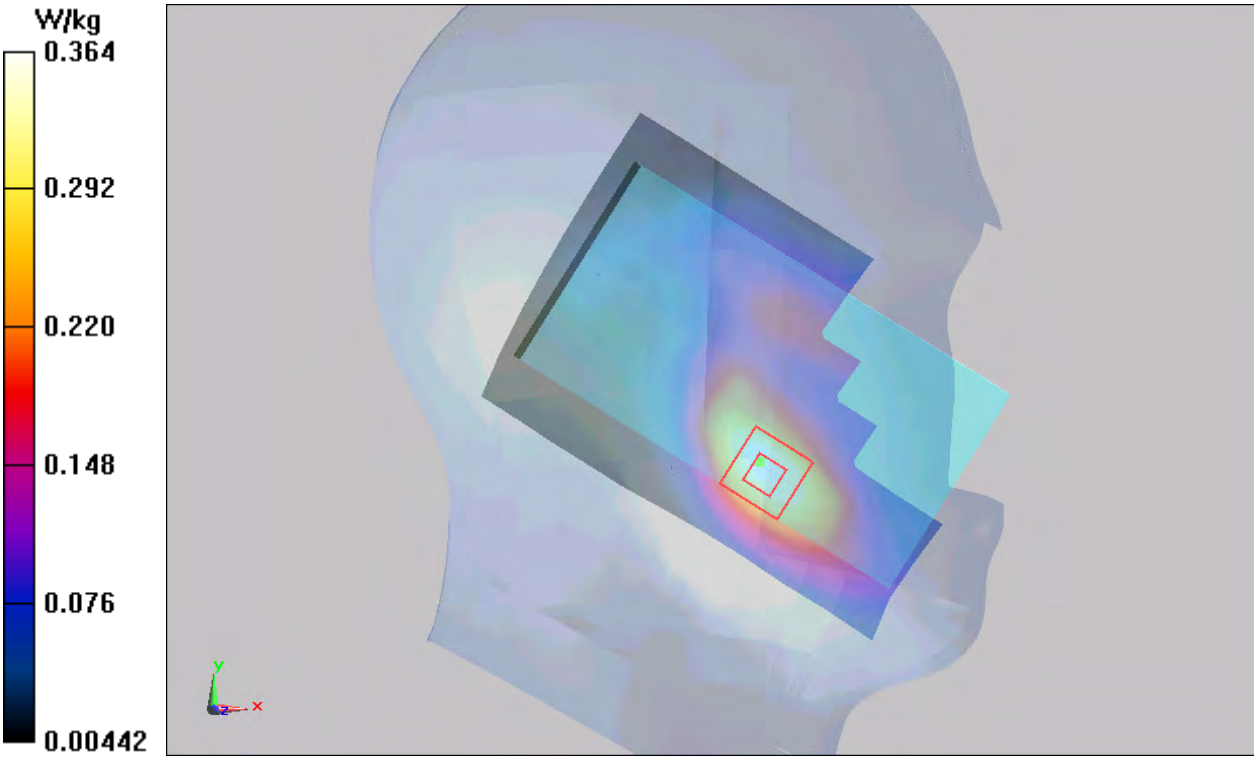

Figure 15 Left Hand Touch Cheek UMTS Band II Channel 9400

This report shall not be reproduced except in full, without the written approval of TA Technology (Shanghai) Co., Ltd.

UMTS Band II Back Side High

Date: 12/15/2015

Communication System: UID 0, WCDMA (0); Frequency: 1907.6 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1908 MHz; σ = 1.522 S/m; ε_r = 52.553; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side High/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.38 W/kg

Back Side High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.34 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 2.22 W/kg

SAR(1 g) = 1.32 W/kg; SAR(10 g) = 0.708 W/kg

Maximum value of SAR (measured) = 1.47 W/kg

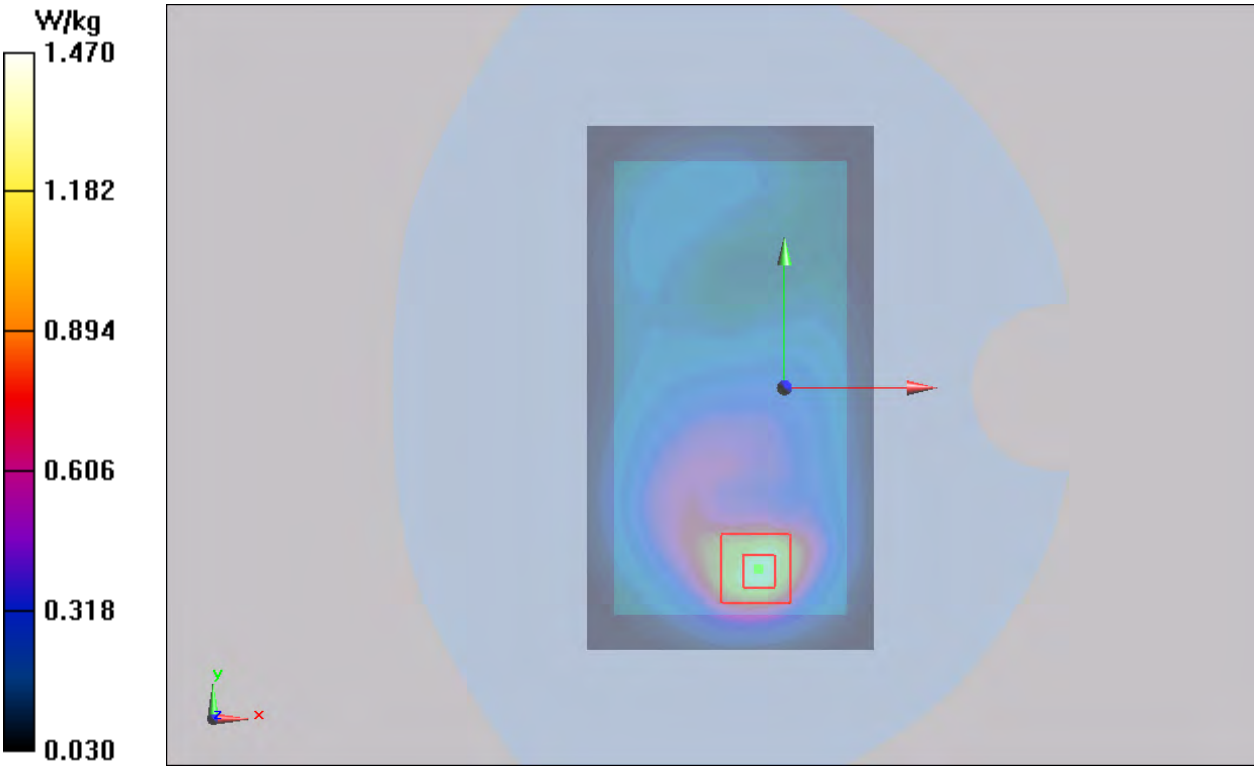

Figure 16 Body, Back Side, UMTS Band II Channel 9538

This report shall not be reproduced except in full, without the written approval of TA Technology (Shanghai) Co., Ltd.

UMTS Band II Bottom Edge High

Date: 12/15/2015

Communication System: UID 0, WCDMA (0); Frequency: 1907.6 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1908 MHz; σ = 1.522 S/m; ε_r = 52.553; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Bottom Side High/Area Scan (51x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.55 W/kg

Bottom Side High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 21.17 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 2.45 W/kg

SAR(1 g) = 1.41 W/kg; SAR(10 g) = 0.728 W/kg

Maximum value of SAR (measured) = 1.63 W/kg

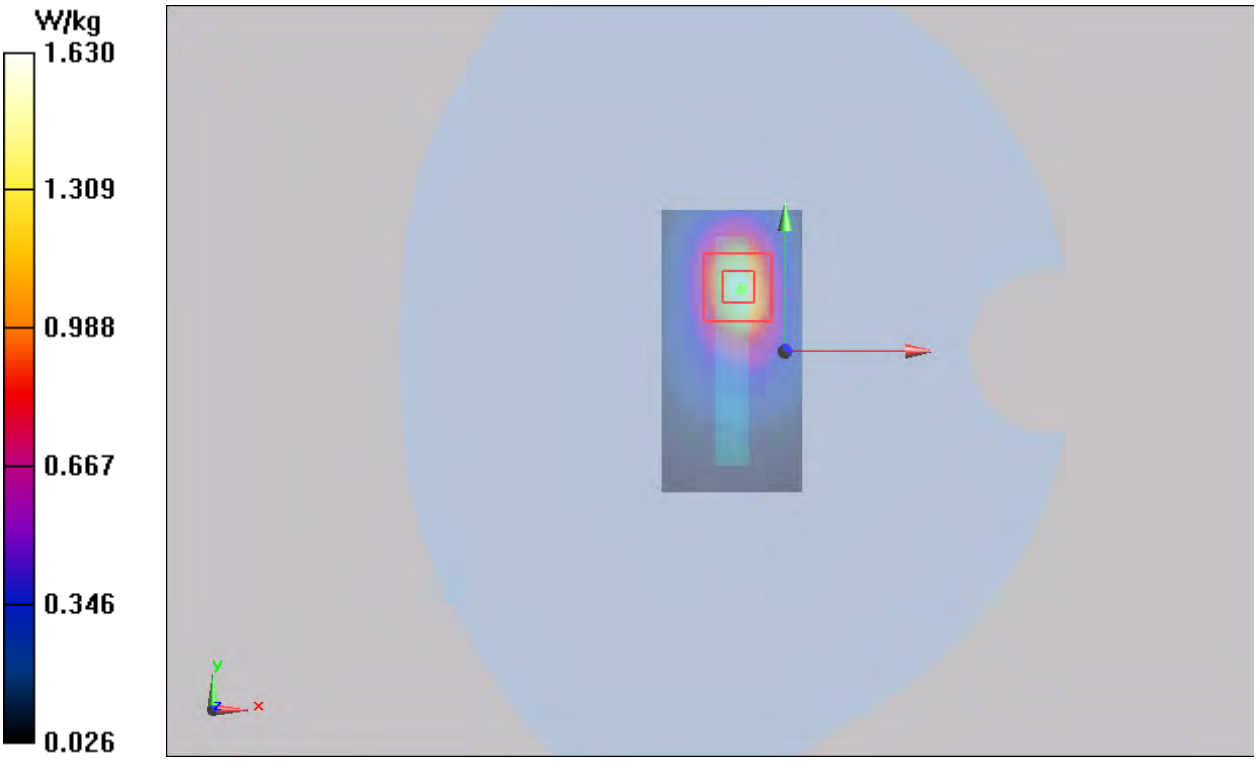

Figure17 Body, Bottom Edge, UMTS Band II Channel 9538

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UMTS Band V Right Cheek Middle

Date: 12/14/2015

Communication System: UID 0, WCDMA (0); Frequency: 836.6 MHz;Duty Cycle: 1:1

Medium parameters used: f = 837 MHz; σ = 0.885 S/m; ε_r = 41.372; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Right Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.30, 9.30, 9.30); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Right Cheek Middle/Area Scan (71x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.130 W/kg

Right Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.061 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 0.146 W/kg

SAR(1 g) = 0.123 W/kg; SAR(10 g) = 0.096 W/kg

Maximum value of SAR (measured) = 0.129 W/kg

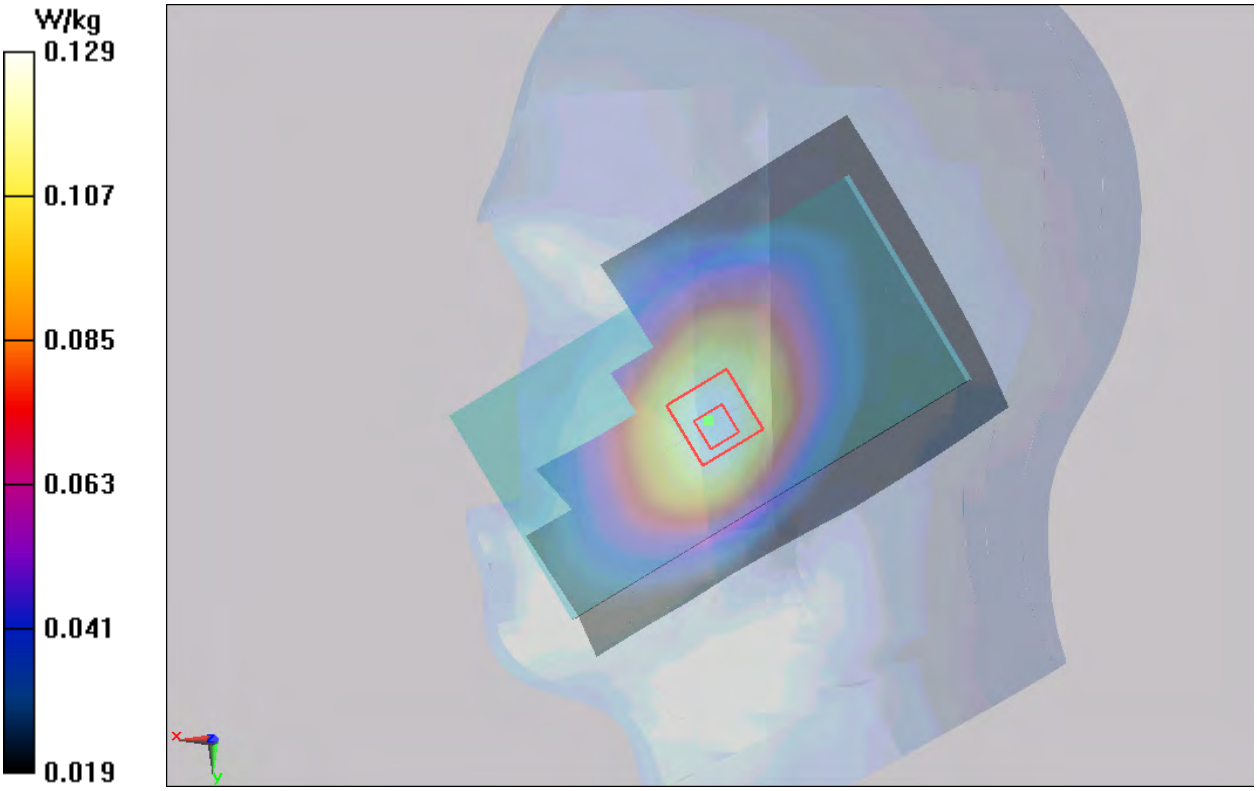

Figure 18 Right Hand Touch Cheek UMTS Band V Channel 4183

This report shall not be reproduced except in full, without the written approval of TA Technology (Shanghai) Co., Ltd.

UMTS Band V Back Side Middle

Date: 12/14/2015

Communication System: UID 0, WCDMA (0); Frequency: 836.6 MHz;Duty Cycle: 1:1

Medium parameters used: f = 837 MHz; σ = 0.967 S/m; ε_r = 54.144; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.45, 9.45, 9.45); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.305 W/kg

Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 18.04 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.352 W/kg

SAR(1 g) = 0.292 W/kg; SAR(10 g) = 0.226 W/kg

Maximum value of SAR (measured) = 0.306 W/kg

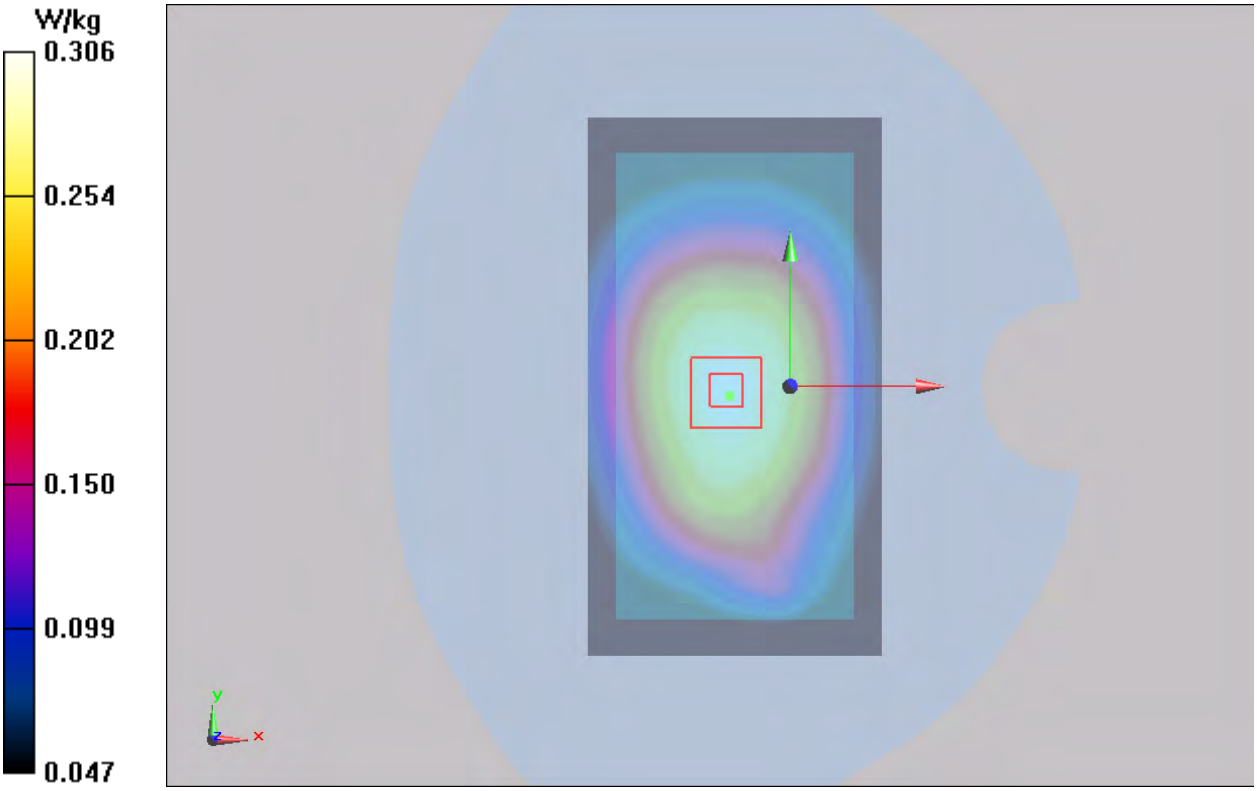

Figure 19 Body, Back Side, UMTS Band V Channel 4183

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802.11b Right Cheek Middle

Date: 12/16/2015

Communication System: UID 0, 802.11b (0); Frequency: 2437 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2437 MHz; σ = 1.79 S/m; ε_r = 38.666; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Right Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.22, 7.22, 7.22); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Right Cheek Middle/Area Scan (91x141x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.577 W/kg

Right Cheek Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.436 V/m; Power Drift = 0.070 dB

Peak SAR (extrapolated) = 1.13 W/kg

SAR(1 g) = 0.552 W/kg; SAR(10 g) = 0.265 W/kg

Maximum value of SAR (measured) = 0.618 W/kg

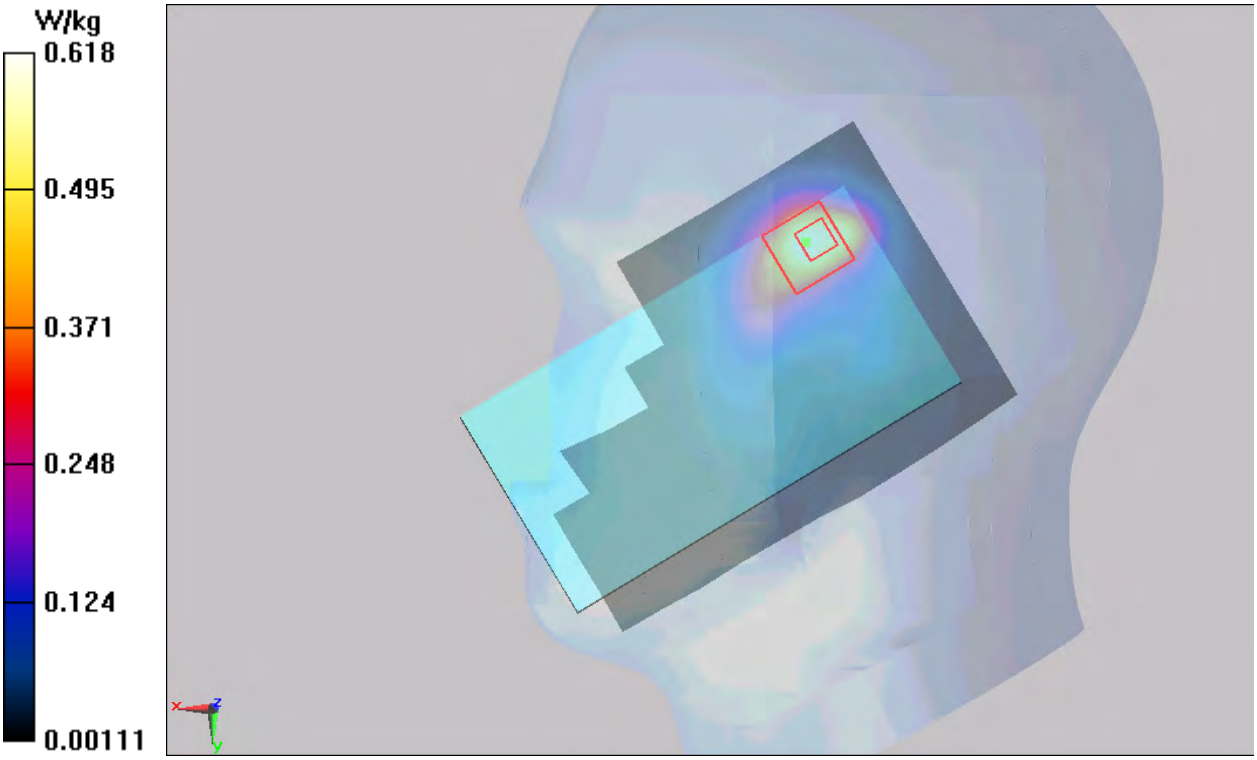

Figure 20 Right Hand Touch Cheek 802.11b Channel 6

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802.11b Back Side Middle

Date: 12/16/2015

Communication System: UID 0, 802.11b (0); Frequency: 2437 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2437 MHz; σ = 1.963 S/m; ε_r = 52.54; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.42, 7.42, 7.42); Calibrated: 1/30/2015;

Electronics: DAE4 Sn1317; Calibrated: 1/29/2015

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (91x141x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.145 W/kg

Back Side Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.399 V/m; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 0.266 W/kg

SAR(1 g) = 0.131 W/kg; SAR(10 g) = 0.066 W/kg

Maximum value of SAR (measured) = 0.137 W/kg

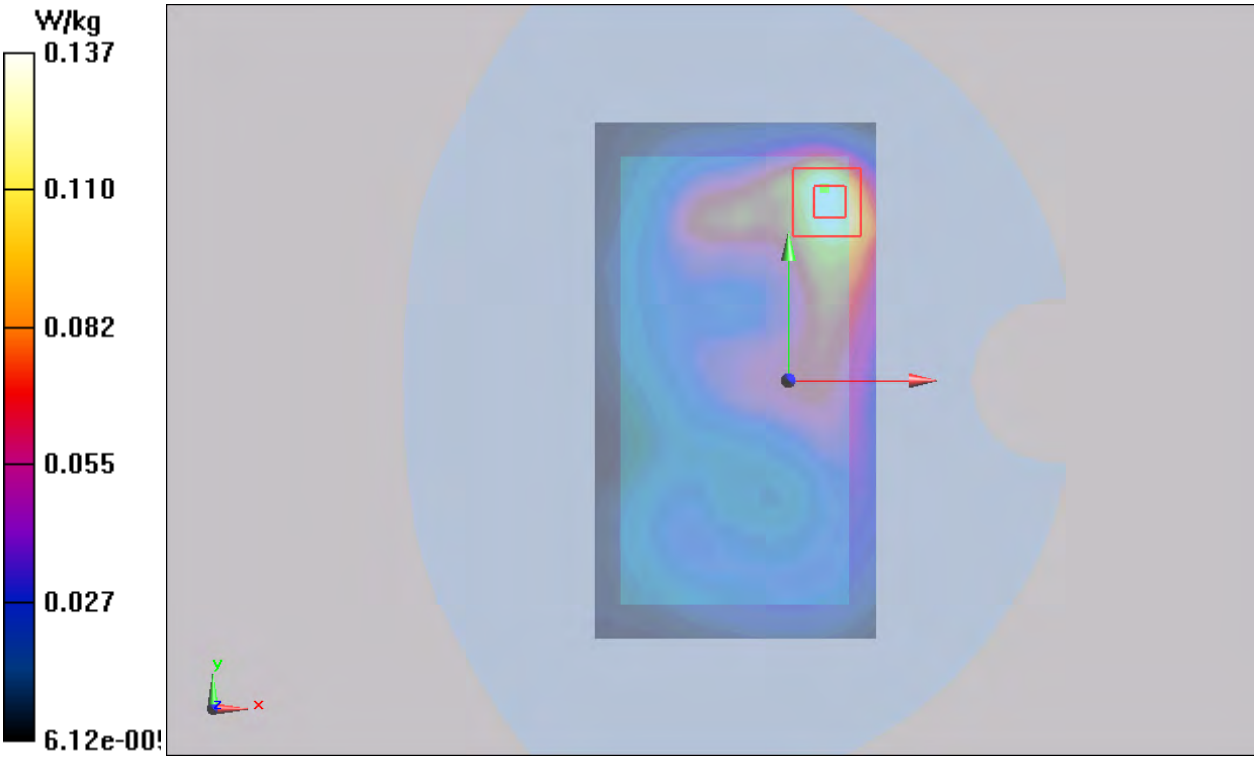

Figure21 Body, Back Side, 802.11b Channel 6

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ANNEX D: Probe Calibration Certificate

In Collaboration with
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CALIBRATION LABORATORY

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

CALIBRATION No. L0570

Client TA-ShangHai Certificate No: Z15-97010

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3677
Calibration Procedure(s)	FD-Z11-2-004-01 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	January 30, 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)℃ 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	18N50W-10dB	13-Mar-14(TMC,No.JZ14-1103)	Mar-16
Reference20dBAttenuator	18N50W-20dB	13-Mar-14(TMC,No.JZ14-1104)	Mar-16
Reference Probe EX3DV4	SN 3617	28-Aug-14(SPEAG,No.EX3-3617_Aug14)	Aug-15
DAE4	SN 777	17-Sep-14 (SPEAG, DAE4-777_Sep14)	Sep -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: January 31, 2015

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

Certificate No: Z15-97010 Page 1 of 11

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

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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E-mail: cttl@chinattl.com Http://www.chinattl.cn

Probe EX3DV4

SN: 3677

Calibrated: January 30, 2015

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

Certificate No: Z15-97010 Page 3 of 11

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Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(μV/(V/m)^2)[A]	0.41	0.46	0.40	±10.8%
DCP(mV)[B]	101.9	102.0	104.6	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	182.5	±2.3%
		Y	0.0	0.0	1.0		198.5	
		Z	0.0	0.0	1.0		179.8	

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

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

Certificate No: Z15-97010 Page 4 of 11

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	41.9	0.89	9.79	9.79	9.79	0.30	0.84	±12%
835	41.5	0.90	9.30	9.30	9.30	0.19	1.05	±12%
1750	40.1	1.37	8.02	8.02	8.02	0.21	1.14	±12%
1900	40.0	1.40	7.94	7.94	7.94	0.24	1.04	±12%
2450	39.2	1.80	7.22	7.22	7.22	0.65	0.68	±12%
2600	39.0	1.96	6.94	6.94	6.94	0.33	0.95	±12%
5200	36.0	4.66	5.55	5.55	5.55	0.42	1.18	±13%
5300	35.9	4.76	5.35	5.35	5.35	0.45	1.05	±13%
5600	35.5	5.07	5.05	5.05	5.05	0.42	1.26	±13%
5800	35.3	5.27	5.01	5.01	5.01	0.48	1.13	±13%

[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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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

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	9.53	9.53	9.53	0.15	1.46	±12%
835	55.2	0.97	9.45	9.45	9.45	0.17	1.35	±12%
1750	53.4	1.49	7.74	7.74	7.74	0.18	1.36	±12%
1900	53.3	1.52	7.57	7.57	7.57	0.18	1.31	±12%
2450	52.7	1.95	7.42	7.42	7.42	0.37	1.08	±12%
2600	52.5	2.16	7.29	7.29	7.29	0.40	0.97	±12%
5200	49.0	5.30	4.96	4.96	4.96	0.45	1.42	±13%
5300	48.9	5.42	4.76	4.76	4.76	0.46	1.48	±13%
5600	48.5	5.77	4.36	4.36	4.36	0.49	1.80	±13%
5800	48.2	6.00	4.45	4.45	4.45	0.50	1.20	±13%

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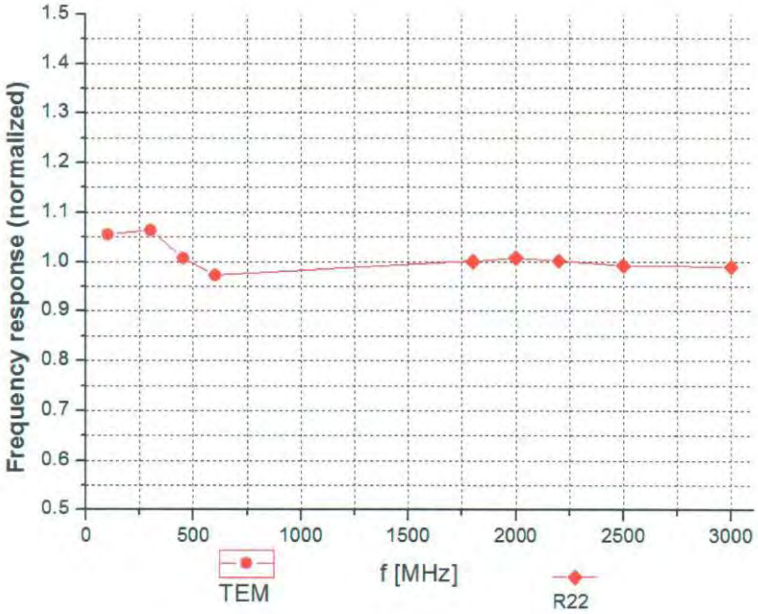
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



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

Certificate No: Z15-97010 Page 7 of 11

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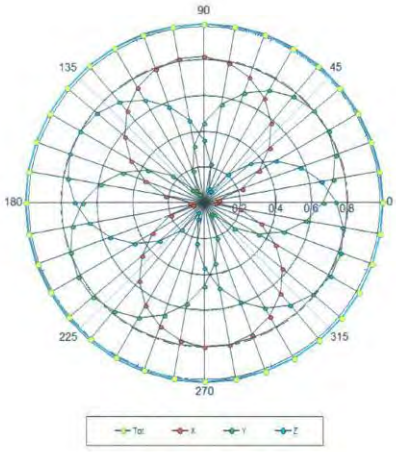
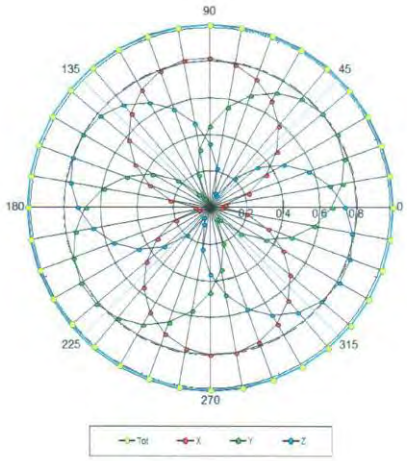
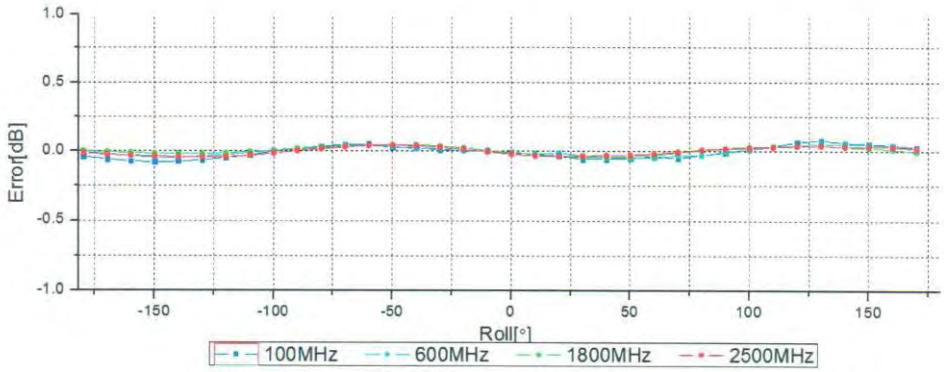
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





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

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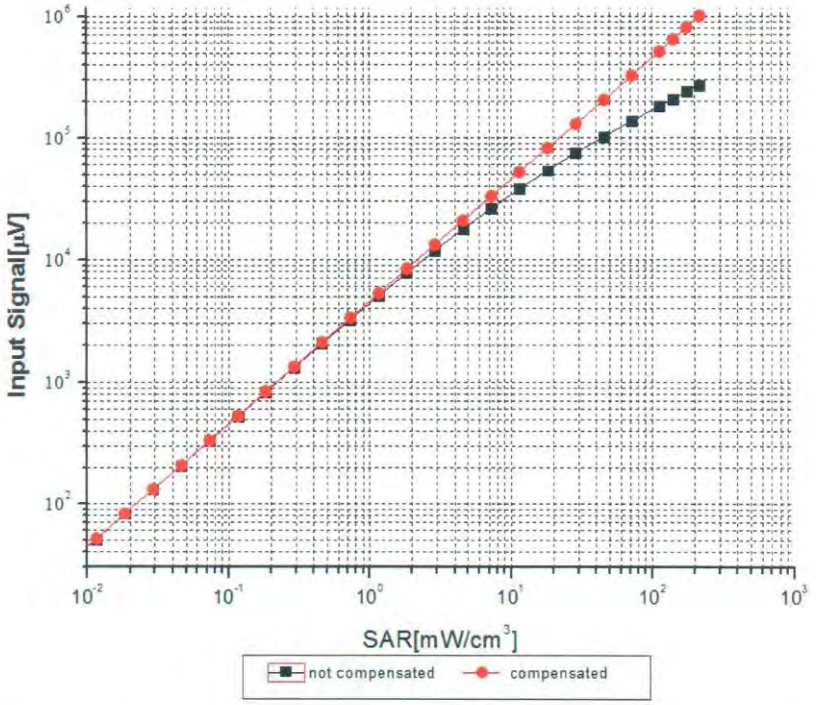
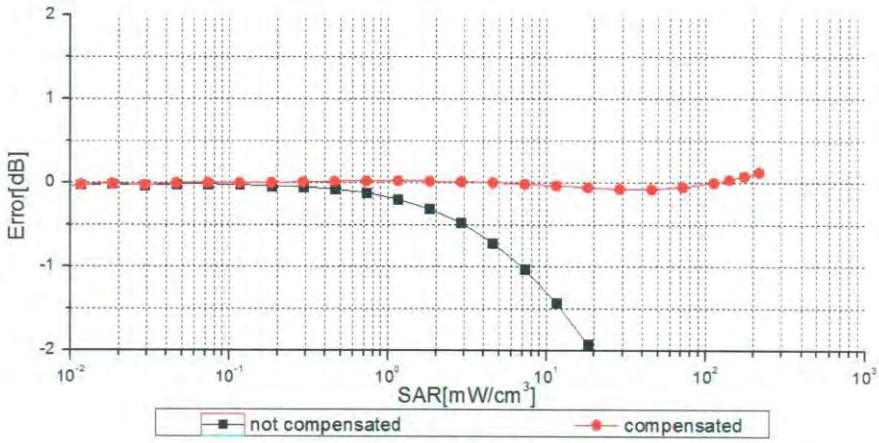
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





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

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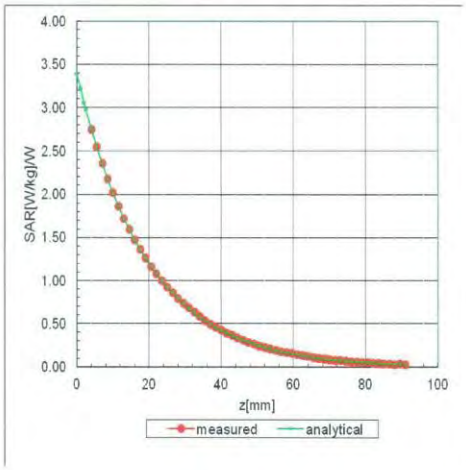
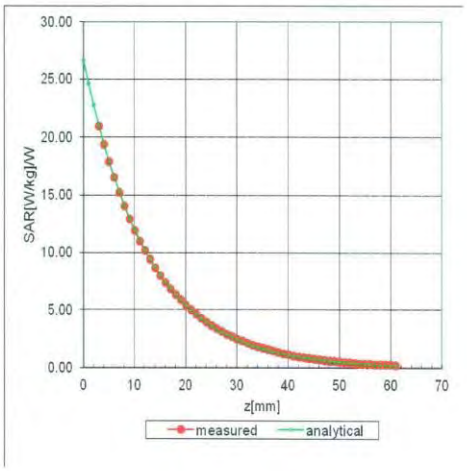
Conversion Factor Assessment

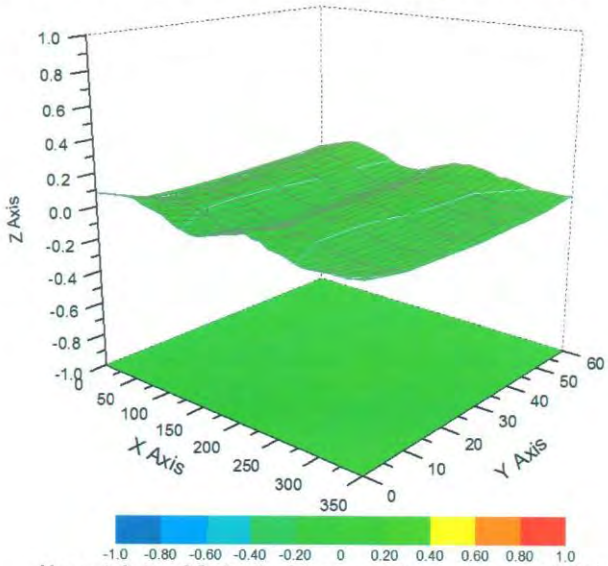
f=835 MHz, WGLS R9(H_convF)



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/EASY – Parameters of Probe: EX3DV4 – SN: 3677

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	116.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

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ANNEX E: D835V2 Dipole Calibration Certificate

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CALIBRATION No. L0570

Client TA(Shanghai) Certificate No: Z14-97073

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d020
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration procedure for dipole validation kits
Calibration date:	August 28, 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 NRVD	102083	11-Sep-13 (TMC, No.JZ13-443)	Sep-14
Power sensor NRV-Z5	100595	11-Sep-13 (TMC, No. JZ13-443)	Sep -14
Reference Probe ES3DV3	SN 3149	5- Sep-13 (SPEAG, No.ES3-3149_Sep13)	Sep-14
DAE3	SN 536	23-Jan-14 (SPEAG, DAE3-536_Jan14)	Jan -15
Signal Generator E4438C	MY49070393	13-Nov-13 (TMC, No.JZ13-394)	Nov-14
Network Analyzer E8362B	MY43021135	19-Oct-13 (TMC, No.JZ13-278)	Oct-14

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

Issued: September 4, 2014

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Certificate No: Z14-97073 Page 1 of 8

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CALIBRATION
No. L0570

Glossary:

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

Calibration is Performed According to the Following Standards:

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

b) IEC 62209-1, "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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ilac-MRA CNAS CALIBRATION No. L0570

Measurement Conditions

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

DASY Version	DASY52	52.8.8.1222
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.5 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.39 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.54 mW / g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.57 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.26 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	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	56.7 ± 6 %	0.97 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.37 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**9.54 mW / g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.57 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.31 mW / g ± 20.4 % (k=2)**

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CALIBRATION No. L0570

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.6Ω +2.75jΩ
Return Loss	- 30.1dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	54.0Ω +5.88jΩ
Return Loss	- 23.3dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1,242 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

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CALIBRATION No. L0570

DASY5 Validation Report for Head TSL Date: 28.08.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

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

Medium parameters used: f = 835 MHz; σ = 0.909 S/m; ε_r = 42.49; ρ = 1000 kg/m^3

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(6.21, 6.21, 6.21); Calibrated: 2013-09-05;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2014-01-23
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

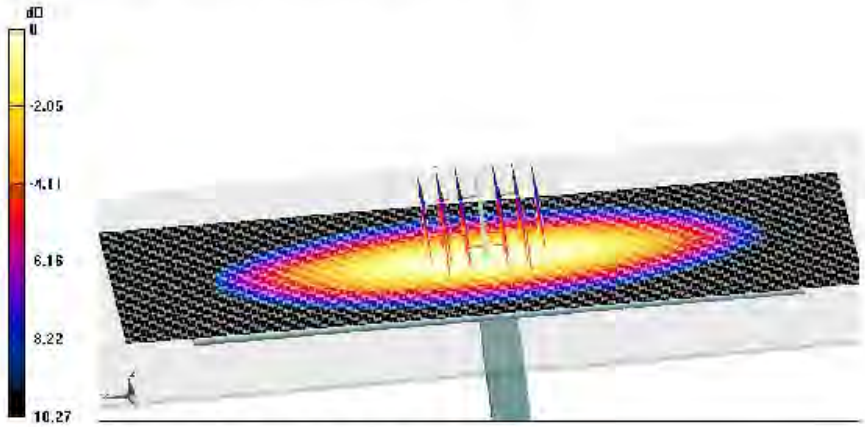
System Performance Check at Frequencies below 1 GHz/d=15mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.88 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.54 W/kg

SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.57 W/kg

Maximum value of SAR (measured) = 2.79 W/kg



0 dB = 2.79 W/kg = 4.46 dBW/kg

Certificate No: Z14-97073 Page 5 of 8

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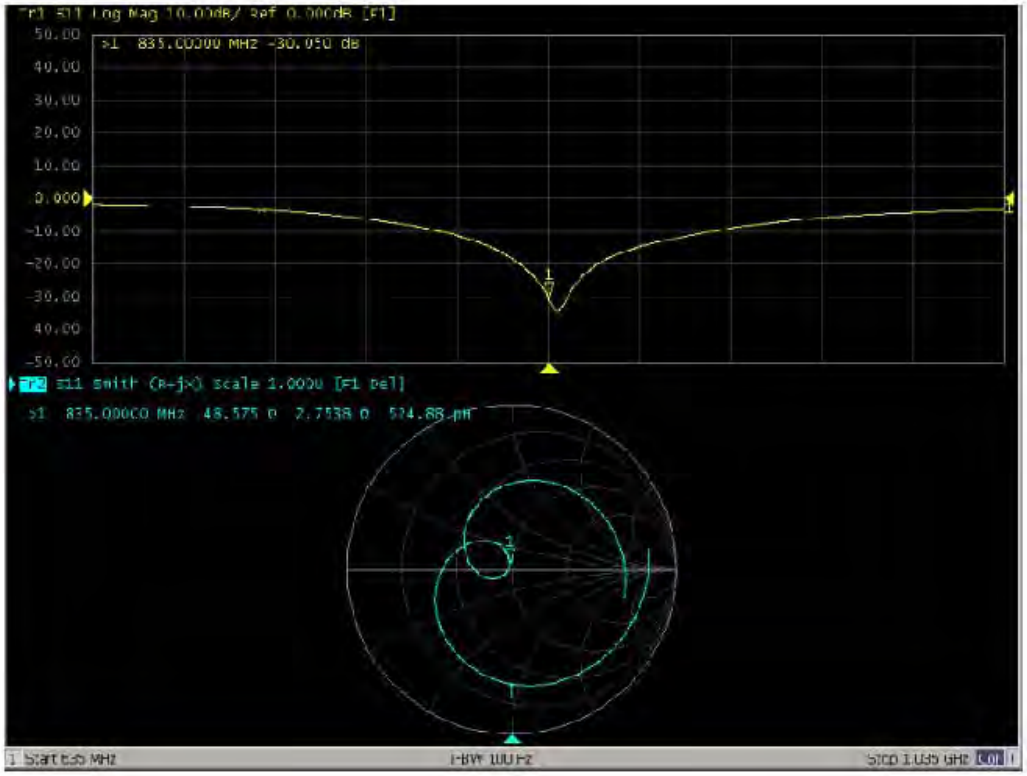
CALIBRATION
No. L0570

Impedance Measurement Plot for Head TSL



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CALIBRATION No. L0570

DASY5 Validation Report for Body TSL Date: 28.08.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

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

Medium parameters used: f = 835 MHz; σ = 0.97 S/m; ε_r = 56.745; ρ = 1000 kg/m^3

Phantom section: Center Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(5.98, 5.98, 5.98); Calibrated: 2013-09-05;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2014-01-23
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/2
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

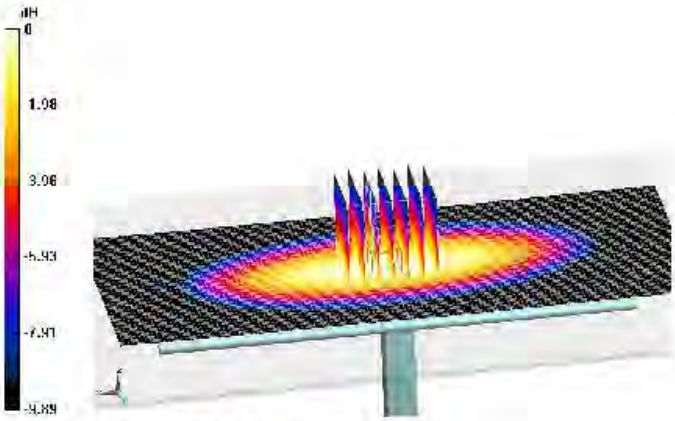
System Performance Check at Frequencies below 1 GHz/d=15mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.515 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.45 W/kg

SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.57 W/kg

Maximum value of SAR (measured) = 2.74 W/kg



0 dB = 2.74 W/kg = 4.38 dBW/kg

Certificate No: Z14-97073 Page 7 of 8

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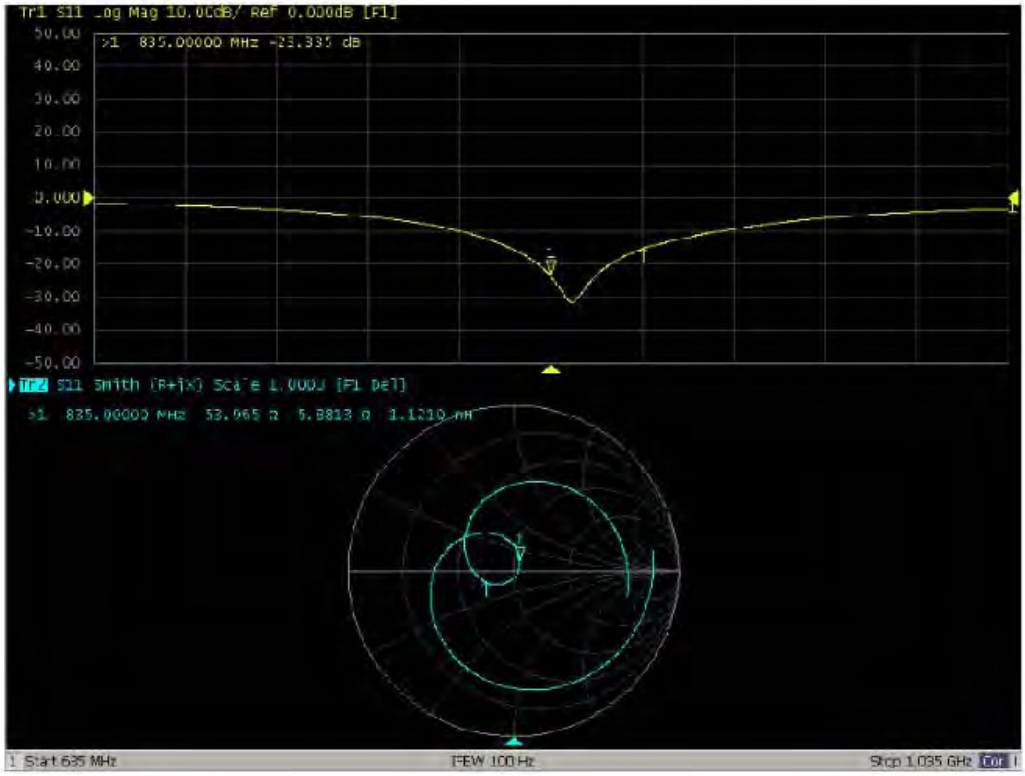
CALIBRATION
No. L0570

Impedance Measurement Plot for Body TSL



Certificate No: Z14-97073 Page 8 of 8

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ANNEX F: D1900V2 Dipole Calibration Certificate

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ilac-MRA CNAS CALIBRATION No. L0570

Client TA(Shanghai) Certificate No: Z14-97074

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d060
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration procedure for dipole validation kits
Calibration date:	September 1, 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 NRVD	102083	11-Sep-13 (TMC, No.JZ13-443)	Sep-14
Power sensor NRV-Z5	100595	11-Sep-13 (TMC, No. JZ13-443)	Sep -14
Reference Probe ES3DV3	SN 3149	5- Sep-13 (SPEAG, No.ES3-3149_Sep13)	Sep-14
DAE3	SN 536	23-Jan-14 (SPEAG, DAE3-536_Jan14)	Jan -15
Signal Generator E4438C	MY49070393	13-Nov-13 (TMC, No.JZ13-394)	Nov-14
Network Analyzer E8362B	MY43021135	19-Oct-13 (TMC, No.JZ13-278)	Oct-14

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

Issued: September 4, 2014

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Certificate No: Z14-97074 Page 1 of 8

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CALIBRATION
No. L0570

Glossary:

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

Calibration is Performed According to the Following Standards:

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

b) IEC 62209-1, "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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ilac-MRA CNAS CALIBRATION No. L0570

Measurement Conditions

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

DASY Version	DASY52	52.8.8.1222
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.8 ± 6 %	1.37 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.69 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**39.2 mW / g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.14 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**20.7 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	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.8 ± 6 %	1.50 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.98 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**40.0 mW / g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.28 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.1 mW / g ± 20.4 % (k=2)**

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CALIBRATION
No. L0570

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.1Ω- 6.34jΩ
Return Loss	- 22.8dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	57.6Ω- 4.76jΩ
Return Loss	- 21.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1,248 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

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ilac-MRA CNAS CALIBRATION No. L0570

DASY5 Validation Report for Head TSL Date: 01.09.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Communication System: UID 0, CW; Frequency: 1900 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.371 S/m; ε_r = 39.83; ρ = 1000 kg/m^3

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(5.06, 5.06, 5.06); Calibrated: 2013-09-05;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2014-01-23
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

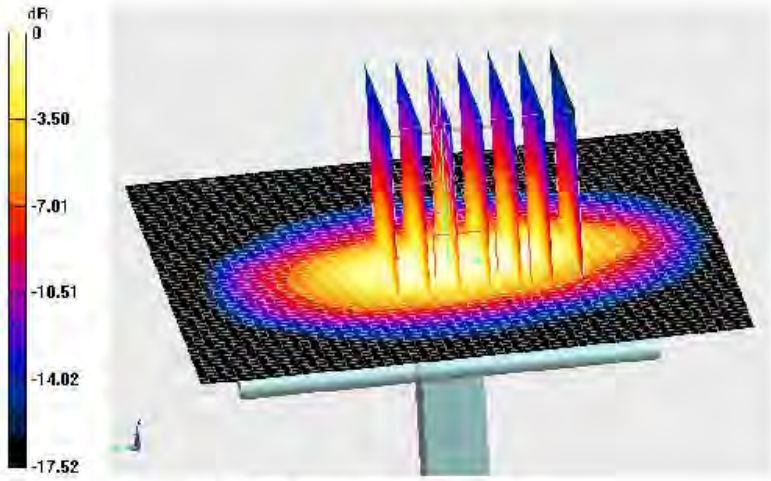
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.911 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 17.5 W/kg

SAR(1 g) = 9.69 W/kg; SAR(10 g) = 5.14 W/kg

Maximum value of SAR (measured) = 12.2 W/kg



0 dB = 12.2 W/kg = 10.86 dBW/kg

Certificate No: Z14-97074 Page 5 of 8

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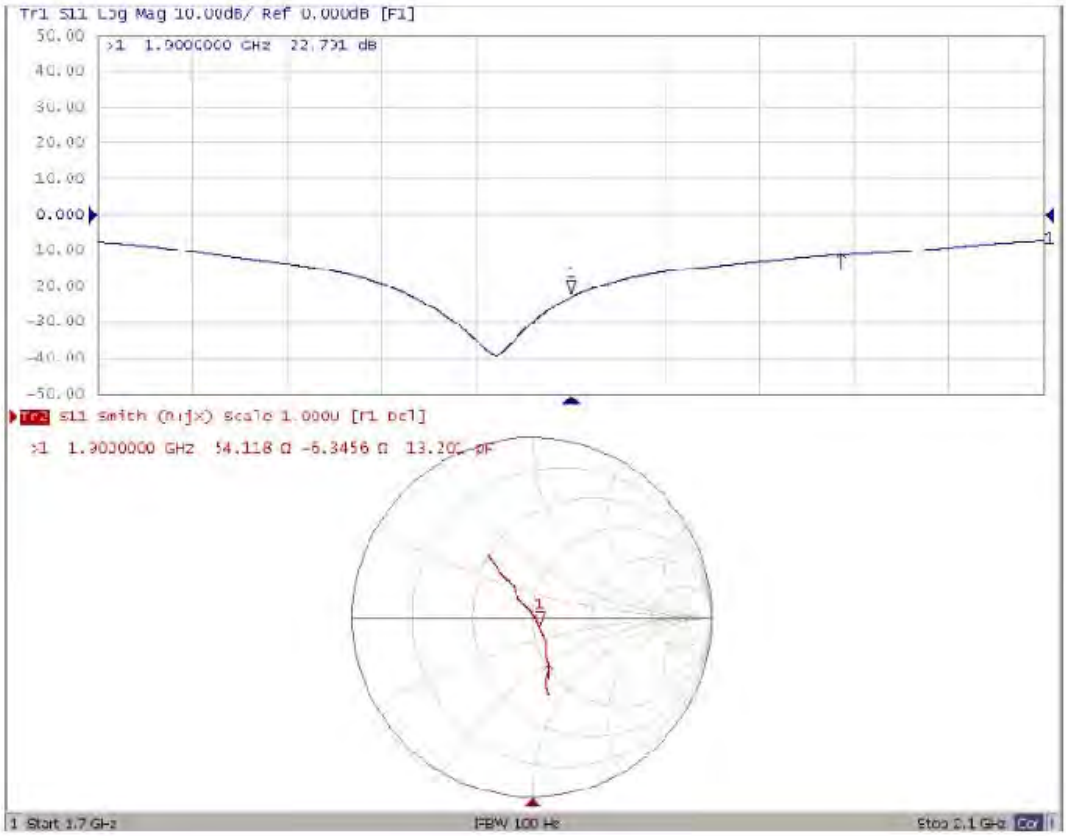
CALIBRATION
No. L0570

Impedance Measurement Plot for Head TSL



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CALIBRATION No. L0570

DASY5 Validation Report for Body TSL Date: 01.09.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Communication System: UID 0, CW; Frequency: 1900 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.5 S/m; ε_r = 51.78; ρ = 1000 kg/m^3

Phantom section: Center Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(4.72, 4.72, 4.72); Calibrated: 2013-09-03;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2014-01-23
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/2
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

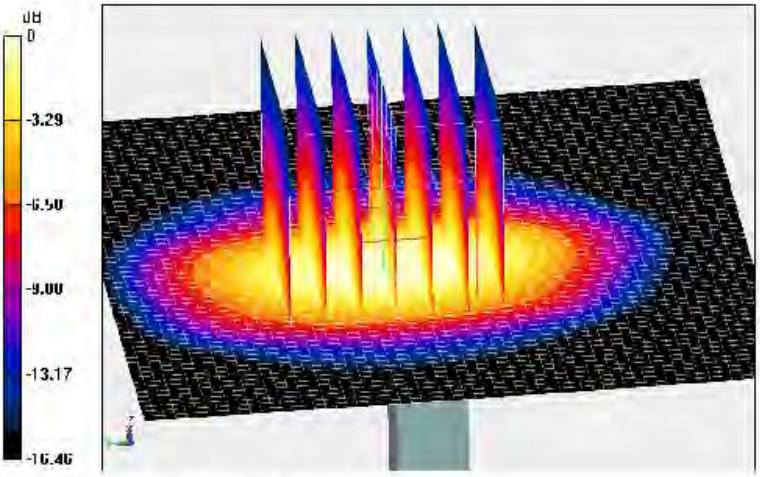
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.668 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 17.6 W/kg

SAR(1 g) = 9.98 W/kg; SAR(10 g) = 5.28 W/kg

Maximum value of SAR (measured) = 12.6 W/kg



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

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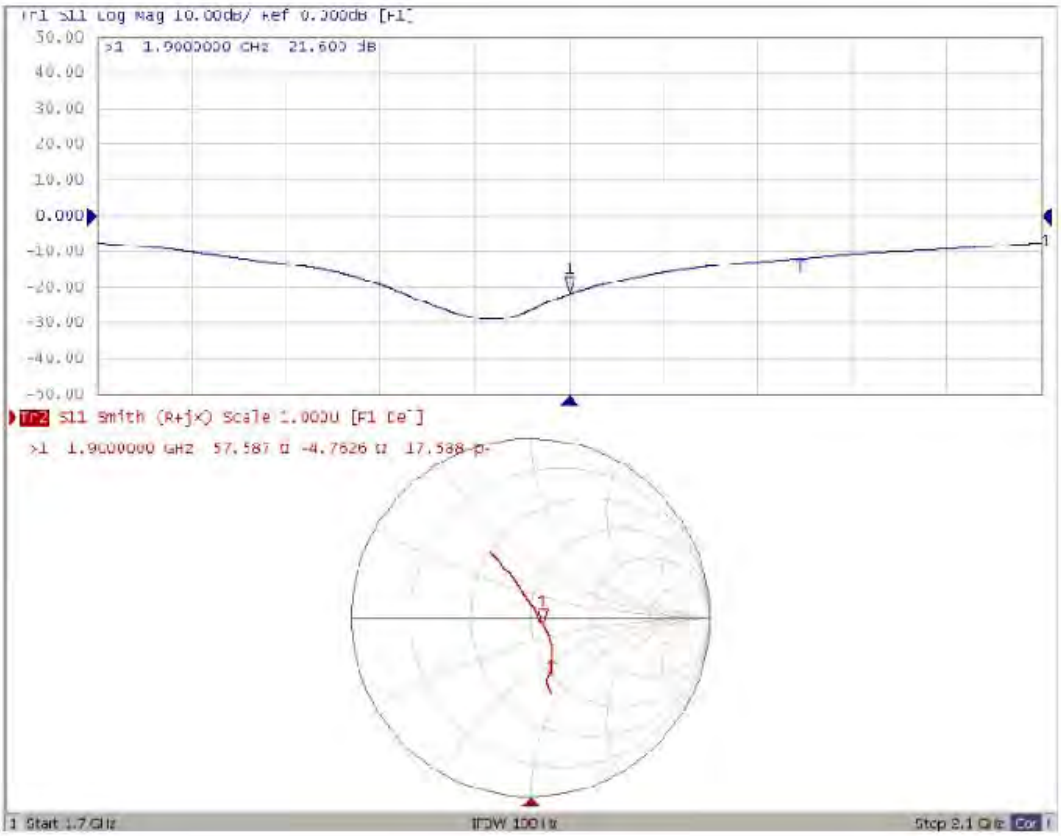
Impedance Measurement Plot for Body TSL



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ANNEX G: D2450V2 Dipole Calibration Certificate

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ilac-MRA CNAS CALIBRATION No. L0570

Client TA(Shanghai) Certificate No: Z14-97075

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 786
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration procedure for dipole validation kits
Calibration date:	September 1, 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 NRVD	102083	11-Sep-13 (TMC, No.JZ13-443)	Sep-14
Power sensor NRV-Z5	100595	11-Sep-13 (TMC, No. JZ13-443)	Sep -14
Reference Probe ES3DV3	SN 3149	5- Sep-13 (SPEAG, No.ES3-3149_Sep13)	Sep-14
DAE3	SN 536	23-Jan-14 (SPEAG, DAE3-536_Jan14)	Jan -15
Signal Generator E4438C	MY49070393	13-Nov-13 (TMC, No.JZ13-394)	Nov-14
Network Analyzer E8362B	MY43021135	19-Oct-13 (TMC, No.JZ13-278)	Oct-14

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

Issued: September 4, 2014

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Certificate No: Z14-97075 Page 1 of 8

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CALIBRATION
No. L0570

Glossary:

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

Calibration is Performed According to the Following Standards:

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

b) IEC 62209-1, "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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CALIBRATION No. L0570

Measurement Conditions

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

DASY Version	DASY52	52.8.8.1222
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.2 ± 6 %	1.84 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**52.5 mW / g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.20 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.8 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.3 ± 6 %	2.00 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.3 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**52.4 mW / g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.20 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**24.6 mW / g ± 20.4 % (k=2)**

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CALIBRATION
No. L0570

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	57.1Ω-0.57jΩ
Return Loss	-23.6dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	56.0Ω+3.31jΩ
Return Loss	-23.7dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.192 ns

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

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

Additional EUT Data

Manufactured by	SPEAG

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CALIBRATION No. L0570

DASY5 Validation Report for Head TSL Date: 01.09.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

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

Medium parameters used: f = 2450 MHz; σ = 1.84 S/m; ε_r = 40.2; p = 1000 kg/m^3

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(4.48, 4.48, 4.48); Calibrated: 2013-09-05;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2014-01-23
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

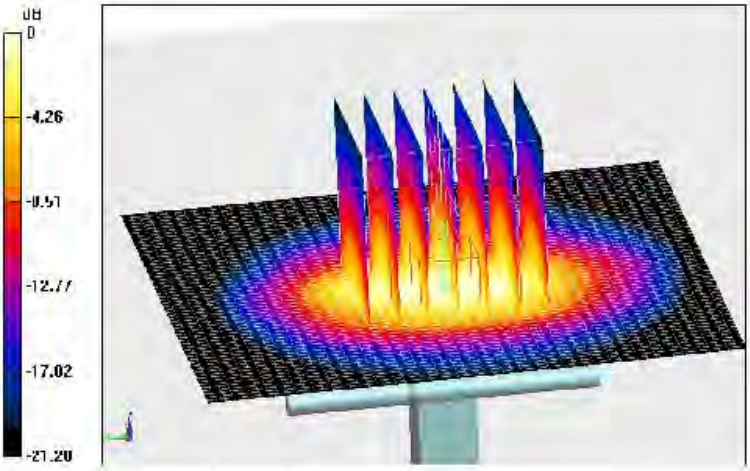
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.583 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 26.6 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.2 W/kg

Maximum value of SAR (measured) = 17.3 W/kg



0 dB = 17.3 W/kg = 12.38 dBW/kg

Certificate No: Z14-97075 Page 5 of 8

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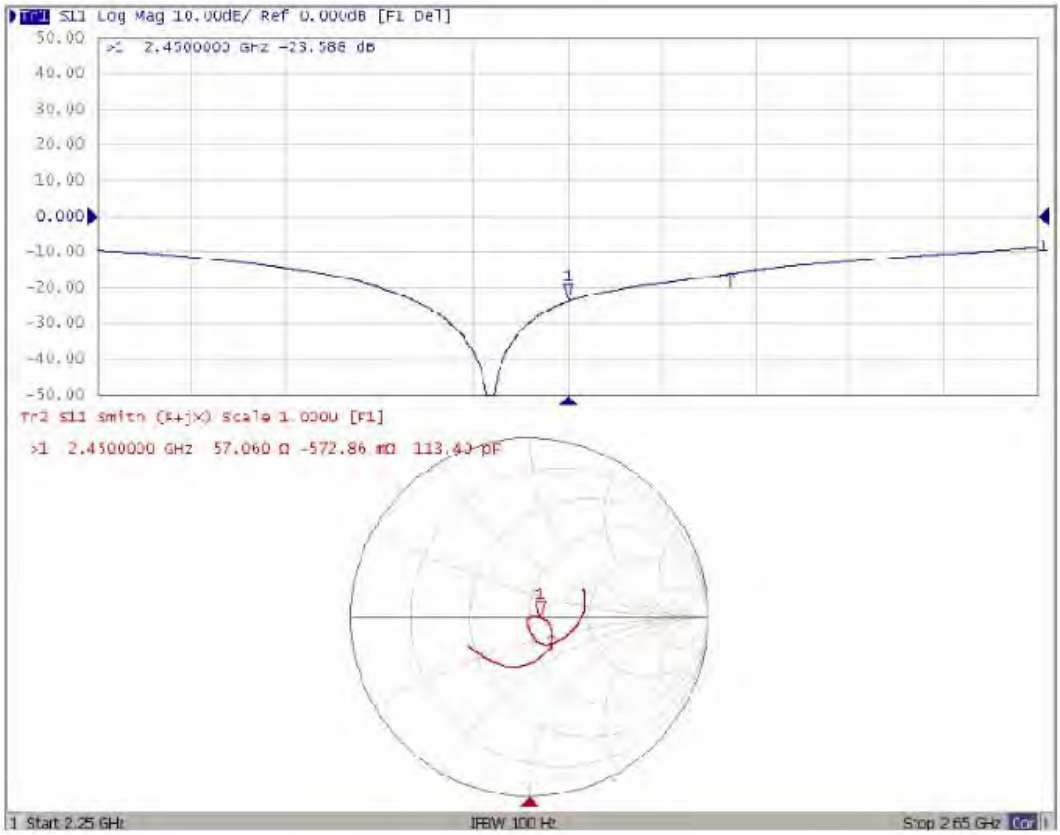
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

CALIBRATION
No. L0570

Impedance Measurement Plot for Head TSL



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CALIBRATION No. L0570

DASY5 Validation Report for Body TSL Date: 01.09.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

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

Medium parameters used: f = 2450 MHz; σ = 1.988 S/m; ε_r = 51.25; ρ = 1000 kg/m^3

Phantom section: Center Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(4.21, 4.21, 4.21); Calibrated: 2013-09-03;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2014-01-23
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/2
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

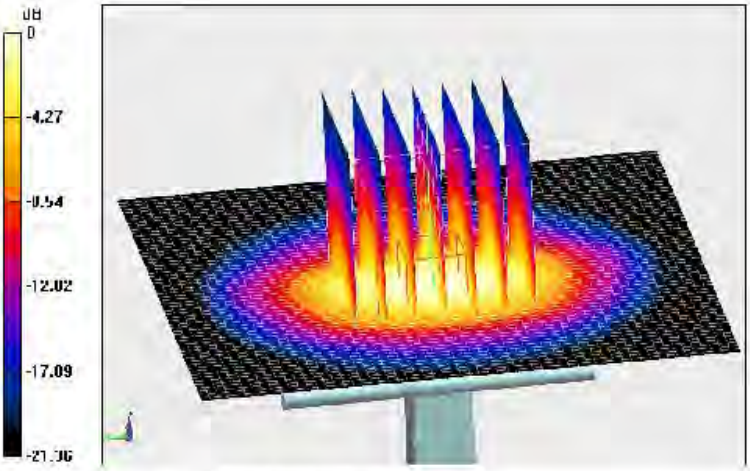
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.120 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 27.8 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.2 W/kg

Maximum value of SAR (measured) = 17.7 W/kg



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

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CALIBRATION
No. L0570

Impedance Measurement Plot for Body TSL

Certificate No: Z14-97075 Page 8 of 8

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ANNEX H: DAE4 Calibration Certificate

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

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

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

Accreditation No.: SCS 0108

Client TA-SH (Auden)

Certificate No: DAE4-1317_Jan15

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BM - SN: 1317
Calibration procedure(s)	QA CAL-06.v29 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	January 29, 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
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-14 (No:15573)	Oct-15
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	06-Jan-15 (in house check)	In house check: Jan-16
Calibrator Box V2.1	SE UMS 006 AA 1002	06-Jan-15 (in house check)	In house check: Jan-16

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	
Approved by:	Fin Bomholt	Deputy Technical Manager	

Issued: January 29, 2015

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Certificate No: DAE4-1317_Jan15 Page 1 of 5

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

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

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

Accreditation No.: SCS 0108

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.

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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	404.087 ± 0.02% (k=2)	405.149 ± 0.02% (k=2)	404.286 ± 0.02% (k=2)
Low Range	3.99359 ± 1.50% (k=2)	3.99071 ± 1.50% (k=2)	3.98868 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	116.0 ° ± 1 °

Certificate No: DAE4-1317_Jan15 Page 3 of 5

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Appendix (Additional assessments outside the scope of SCS108)

1. DC Voltage Linearity

High Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	200024.75	-6.34	-0.00
Channel X	+ Input	20003.94	0.73	0.00
Channel X	- Input	-20001.98	3.53	-0.02
Channel Y	+ Input	200025.28	-5.38	-0.00
Channel Y	+ Input	20001.43	-1.84	-0.01
Channel Y	- Input	-20005.03	0.56	-0.00
Channel Z	+ Input	200026.19	-11.26	-0.01
Channel Z	+ Input	20000.52	-2.67	-0.01
Channel Z	- Input	-20006.04	-0.41	0.00

Low Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	1999.98	0.16	0.01
Channel X	+ Input	200.50	0.64	0.32
Channel X	- Input	-198.91	1.20	-0.60
Channel Y	+ Input	2000.74	0.91	0.05
Channel Y	+ Input	199.51	-0.28	-0.14
Channel Y	- Input	-200.05	0.14	-0.07
Channel Z	+ Input	2000.14	0.29	0.01
Channel Z	+ Input	198.92	-0.94	-0.47
Channel Z	- Input	-201.14	-0.93	0.47

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	23.60	21.70
	- 200	-20.28	-21.97
Channel Y	200	-21.95	-21.73
	- 200	21.29	21.06
Channel Z	200	-22.01	-22.53
	- 200	20.76	20.55

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	-	2.01	-4.05
Channel Y	200	8.95	-	3.72
Channel Z	200	10.39	5.45	-

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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	15924	15409
Channel Y	16582	17298
Channel Z	16343	16649

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	-0.90	-1.99	0.19	0.50
Channel Y	0.41	-0.73	1.70	0.55
Channel Z	-1.83	-3.90	0.56	0.55

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

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ANNEX I: The EUT Appearances and Test Configuration

Front Side

Back Side

a: EUT

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b: Battery

d: Earphone1

Picture 9: Constituents of EUT

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Picture 10: Left Hand Touch Cheek Position

Picture 11: Left Hand Tilt 15 Degree Position

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Picture 12: Right Hand Touch Cheek Position

Picture 13: Right Hand Tilt 15 Degree Position

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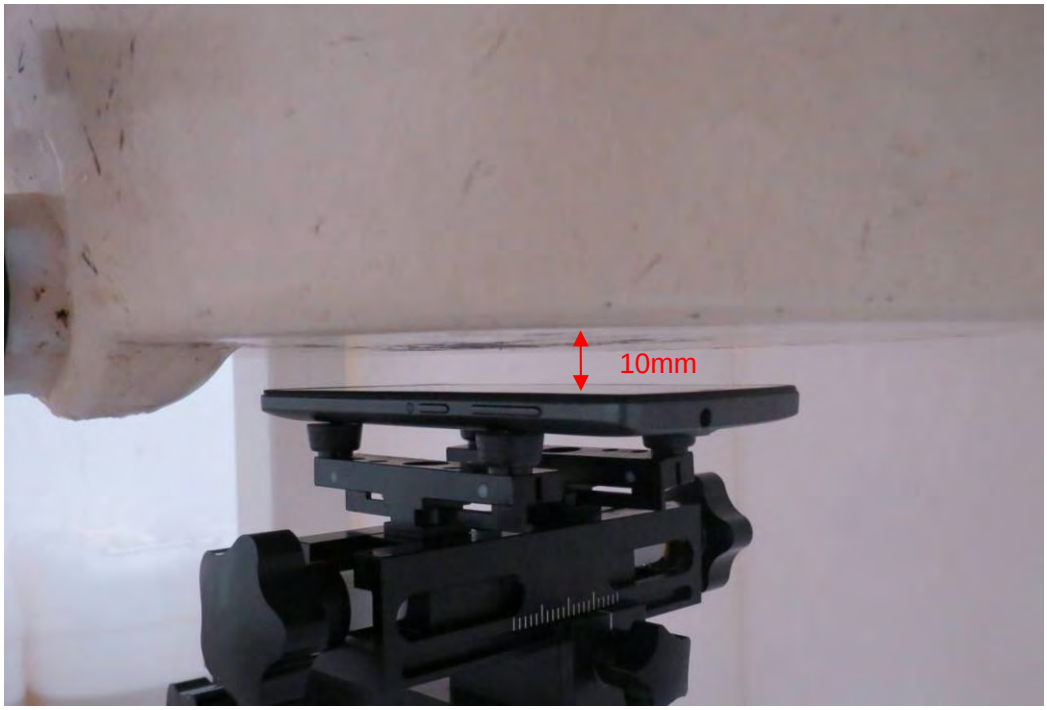
Picture 14: Back Side, the distance from handset to the bottom of the Phantom is 10mm



Picture 15: Front Side, the distance from handset to the bottom of the Phantom is 10mm

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Picture 16: Left Edge, the distance from handset to the bottom of the Phantom is 10mm

Picture 17: Top Edge, the distance from handset to the bottom of the Phantom is 10mm

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Picture 18: Bottom Edge, the distance from handset to the bottom of the Phantom is 10mm

Picture 19: Back Side with Earphone, the distance from handset to the bottom of the Phantom is 10mm

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