SAR TEST REPORT

No. I15Z40836-SEM01

For

Huawei Technologies Co., Ltd.

Smart Phone

Model Name: HUAWEI ALE-L02, ALE-L02

With

Hardware Version: HL3ALICEM

Software Version: ALE-L02 V100R001C900B045

FCC ID: QISALE-L02

Issued Date: 2015-04-15

TESTING
CNAS L0570

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

Test Laboratory:

CTTL, Telecommunication Technology Labs, Academy of Telecommunication Research, MIIT

No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China100191

Tel:+86(0)10-62304633-2512,Fax:+86(0)10-62304633-2504

Email:cttl_terminals@catr.cn, website:www.chinattl.com

REPORT HISTORY

Report Number	Revision	Issue Date	Description
I15Z40836-SEM01	Rev.0	2015-04-15	Initial creation of test report

TABLE OF CONTENT

1 Test Laboratory

1.1 Testing Location

Company Name:	CTTL(Shouxiang)
Address:	No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China100191

1.2 Testing Environment

Temperature:	18°C~25°C,
Relative humidity:	30%~ 70%
Ground system resistance:	< 0.5 Ω
Ambient noise & Reflection:	< 0.012 W/kg

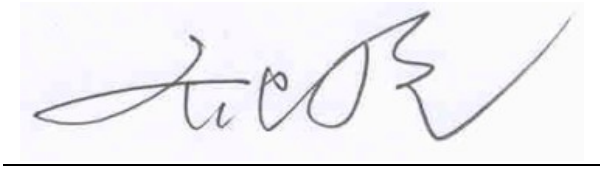
1.3 Project Data

Project Leader:	Qi Dianyuan
Test Engineer:	Lin Xiaojun
Testing Start Date:	April 8, 2015
Testing End Date:	April 8, 2015

1.4 Signature

Lin Xiaojun

(Prepared this test report)



Qi Dianyuan

(Reviewed this test report)

Xiao Li

Deputy Director of the laboratory

(Approved this test report)

2 Statement of Compliance

This EUT is a variant product and the report of original sample is No.I15Z40418-SEM01. According to the client request, we perform the measurement of LTE Band 5 and quote the test results of original sample for other bands.

Table 2.1: Differences between ALE-L23 and ALE-L02

Model	HUAWEI ALE-L23, ALE-L23	HUAWEI ALE-L02, ALE-L02
FCC ID	QISALE-L23	QISALE-L02
Frequency	GSM:850/1900 UMTS:B2/B5/B4 LTE:B2/B4/B7	GSM:850/1900 UMTS:B5 LTE:B5/7 Frequency disabled by software.
Hardware Version	HL3ALICEM	HL3ALICEM
Software Version	ALE-L23 V100R001C900B045	ALE-L02 V100R001C900B045
Dimensions	The same	The same
Appearance	The same	The same
main antenna	The same	The same
Div antenna (Only RX)	The same	The same
BT/Wi-Fi antenna	The same	The same
Others	The same	The same

The maximum results of SAR found during testing for Huawei Technologies Co., Ltd. Smart Phone HUAWEI ALE-L02, ALE-L02 are as follows:

Table 2.2: Highest Reported SAR (1g)

Exposure Configuration	Technology Band	Highest Reported SAR 1g(W/Kg)	Equipment Class
Head (Separation Distance 0mm)	GSM 850	0.41	PCE
	PCS 1900	0.56	
	UMTS FDD 5	0.30	
	LTE Band 5	0.40	
	LTE Band 7	0.75	
	WLAN 2.4 GHz	0.09	DTS
Hotspot (Separation Distance 10mm)	GSM 850	0.68	PCE
	PCS 1900	0.53	
	UMTS FDD 5	0.51	
	LTE Band 5	0.60	
	LTE Band 7	0.39	
	WLAN 2.4 GHz	0.03	DTS
Body-worn (Data) (Separation Distance 15mm)	LTE Band 7	0.64	PCE

The SAR values found for the Mobile Phone are below the maximum recommended levels of 1.6 W/Kg as averaged over any 1g tissue according to the ANSI C95.1-1999.

For body worn operation, this device has been tested and meets FCC RF exposure guidelines when used with any accessory that contains no metal and which provides a minimum separation distance of 10 mm for hotspot on and 15mm for hotspot off between this device and the body of the user. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output.

The measurement together with the test system set-up is described in annex C of this test report.
A detailed description of the equipment under test can be found in chapter 4 of this test report.
The highest reported SAR value is obtained at the case of **(Table 2.1),** and the values are**: 0.75 W/kg (1g).**

Table 2.3: The sum of reported SAR values for main antenna and WiFi

	Position	Main antenna	WiFi	Sum
Maximum reported SAR value for Head	Left hand, Touch cheek	0.75	0.09	**0.84**
Maximum reported SAR value for Body	Right Edge	0.68	0.03	**0.71**

Table 2.4: The sum of reported SAR values for main antenna and BT

	Position	Main antenna	BT[1]	Sum
Maximum reported SAR value for Head	Left hand, Touch cheek	0.75	0.37	**1.12**
Maximum reported SAR value for Body	Right Edge	0.68	0.19	**0.87**

[1] - Estimated SAR for Bluetooth (see the table 13.3)

According to the above tables, the highest sum of reported SAR values is **1.12 W/kg (1g)**. The detail for simultaneous transmission consideration is described in chapter 13.

3 Client Information

3.1 Applicant Information

Company Name:	Huawei Technologies Co., Ltd.
Address /Post:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
City:	Shenzhen
Postal Code:	518129
Country:	P.R.China
Contact:	Ma Yan
Email:	angel.mayan@huawei.com
Telephone:	029-89282965
Fax:	/

3.2 Manufacturer Information

Company Name:	Huawei Technologies Co., Ltd.
Address /Post:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
City:	Shenzhen
Postal Code:	518129
Country:	P.R.China
Contact:	Ma Yan
Email:	angel.mayan@huawei.com
Telephone:	029-89282965
Fax:	/

4 Equipment Under Test (EUT) and Ancillary Equipment (AE)

4.1 About EUT

Description:	Smart Phone
Model name:	HUAWEI ALE-L02, ALE-L02
Operating mode(s):	GSM 850/1900, WCDMA 850, BT, WiFi, LTE Band 5/7
Tested Tx Frequency:	825 – 848.8 MHz (GSM 850)
	1850.2 – 1910 MHz (GSM 1900)
	826.4–846.6 MHz (WCDMA850 Band V)
	829 – 844 MHz (LTE Band 5)
	2502.5 – 2567.5 MHz (LTE Band 7)
	2412 – 2462 MHz (Wi-Fi 2.4G)
GPRS/EGPRS Multislot Class:	12
GPRS capability Class:	B
Test device Production information:	Production unit
Device type:	Portable device
Antenna type:	Integrated antenna
Hotspot mode:	Support simultaneous transmission of hotspot and voice(or data)

4.2 Internal Identification of EUT used during the test

EUT ID*	IMEI	HW	SW Version
EUT1	004401722796980	HL3ALICEM	ALE-L02 V100R001C900B045

*EUT ID: is used to identify the test sample in the lab internally.

4.3 Internal Identification of AE used during the test

AE ID*	Description	Model	SN	Manufacturer
AE1	Battery	HB3742A0EZC+	/	SCUD (FUJIAN) Electronics Co., Ltd.
AE2	Battery	HB3742A0EZC+	/	Sunwoda Electronic Co., LTD.
AE3	Headset	MEMD1632B580A00	/	Jiangxi Lianchuang Hongsheng Electronic Co., LTD.
AE4	Headset	1311-3291-3.5mm-178	/	BOLUO COUNTY QUANCHENG ELECTRONIC CO., LTD.
AE5	Headset	EMC323-011-01	/	Merry Electronics Co., LTD.
AE6	Headset	HG-04A	/	Goertek

*AE ID: is used to identify the test sample in the lab internally.

5 TEST METHODOLOGY

5.1 Applicable Limit Regulations

ANSI C95.1–1999:IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

It specifies the maximum exposure limit of **1.6 W/kg** as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

5.2 Applicable Measurement Standards

IEEE 1528–2003: Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques.

KDB447498 D01: General RF Exposure Guidance v05r02: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

KDB648474 D04 Handset SAR v01r02: SAR Evaluation Considerations for Wireless Handsets.

KDB941225 D01 SAR test for 3G devices v03: SAR Measurement Procedures for 3G Devices

KDB941225 D05 SAR for LTE Devices v02r03: SAR Evaluation Considerations for LTE Devices

KDB941225 D06 Hotspot Mode SAR v02: SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities

KDB248227 D01 802.11 Wi-Fi SAR v02: SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS

KDB 865664 D01SAR measurement 100 MHz to 6 GHz v01r03: SAR Measurement Requirements for 100 MHz to 6 GHz.

KDB865664 D02 RF Exposure Reporting v01r01: RF Exposure Compliance Reporting and Documentation Considerations

6 Specific Absorption Rate (SAR)

6.1 Introduction

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

6.2 SAR Definition

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

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

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

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

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

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

Where: σ is the conductivity of the tissue, ρ is the mass density of tissue and E is the RMS electrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

7 Tissue Simulating Liquids

7.1 Targets for tissue simulating liquid

Table 7.1: Targets for tissue simulating liquid

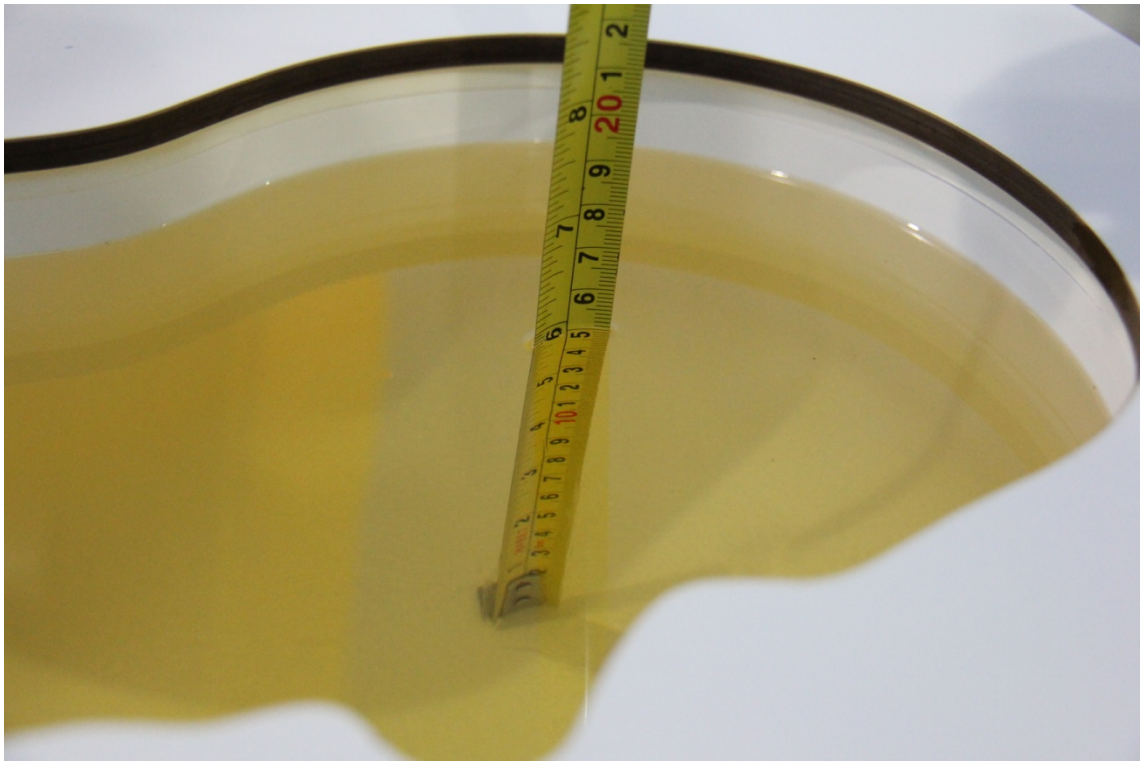
Frequency(MHz)	Liquid Type	Conductivity(σ)	± 5% Range	Permittivity(ε)	± 5% Range
835	Head	0.90	0.86～0.95	41.5	39.4～43.6
835	Body	0.97	0.92～1.02	55.2	52.4～58.0
1900	Head	1.40	1.33～1.47	40.0	38.0～42.0
1900	Body	1.52	1.44～1.60	53.3	50.6～56.0
2450	Head	1.80	1.71～1.89	39.2	37.2～41.2
2450	Body	1.95	1.85～2.05	52.7	50.1～55.3
2600	Head	1.96	1.86～2.06	39.01	37.06～40.96
2600	Body	2.16	2.05～2.27	52.5	49.9～55.1

7.2 Dielectric Performance

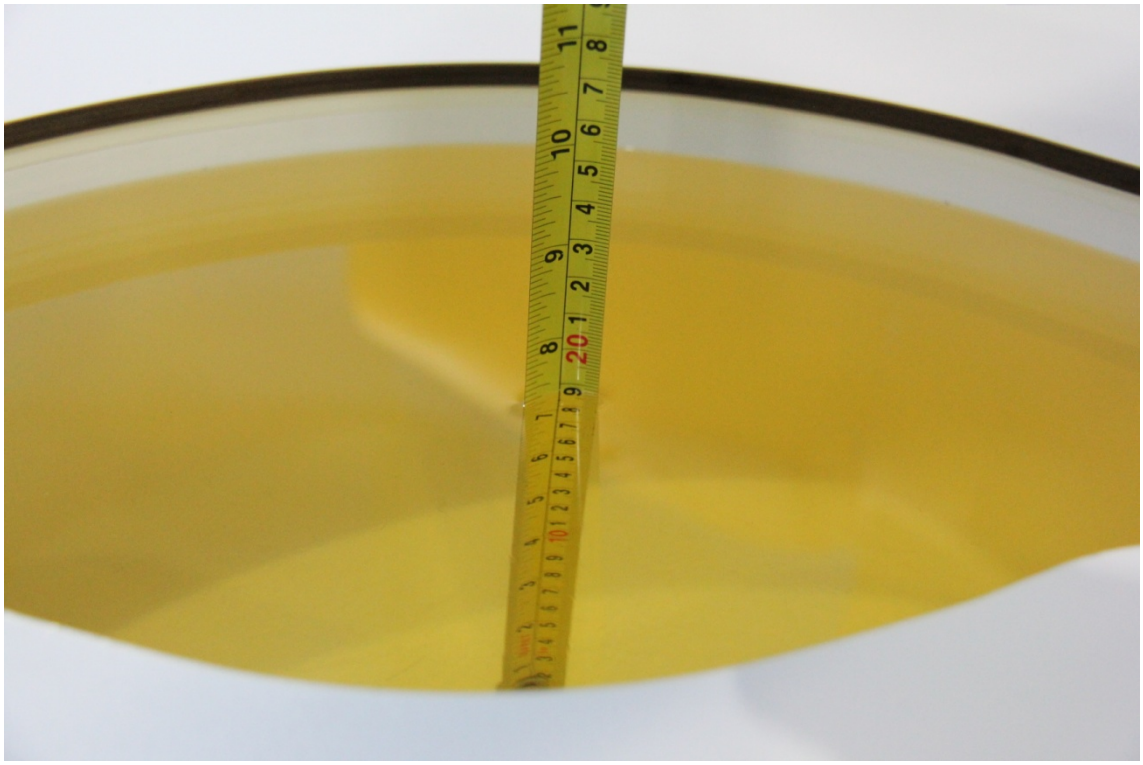
Table 7.2: Dielectric Performance of Tissue Simulating Liquid

Measurement Date (yyyy-mm-dd)	Type	Frequency	Permittivity ε	Drift (%)	Conductivity σ (S/m)	Drift (%)
2015-03-14	Head	835 MHz	42.34	2.02	0.919	2.11
	Body	835 MHz	54.2	-1.81	0.952	-1.86
2015-03-16	Head	1900 MHz	41.08	2.70	1.401	0.07
	Body	1900 MHz	53.99	1.29	1.493	-1.78
2015-03-18	Head	2450 MHz	39.81	1.56	1.779	-1.17
	Body	2450 MHz	52.61	-0.17	1.976	1.33
2015-03-17	Head	2600 MHz	39.39	0.97	1.947	-0.66
	Body	2600 MHz	51.56	-1.79	2.181	0.97
2015-04-08	Head	835 MHz	42.71	2.92	0.904	0.44
	Body	835 MHz	55.42	0.40	0.937	-3.40

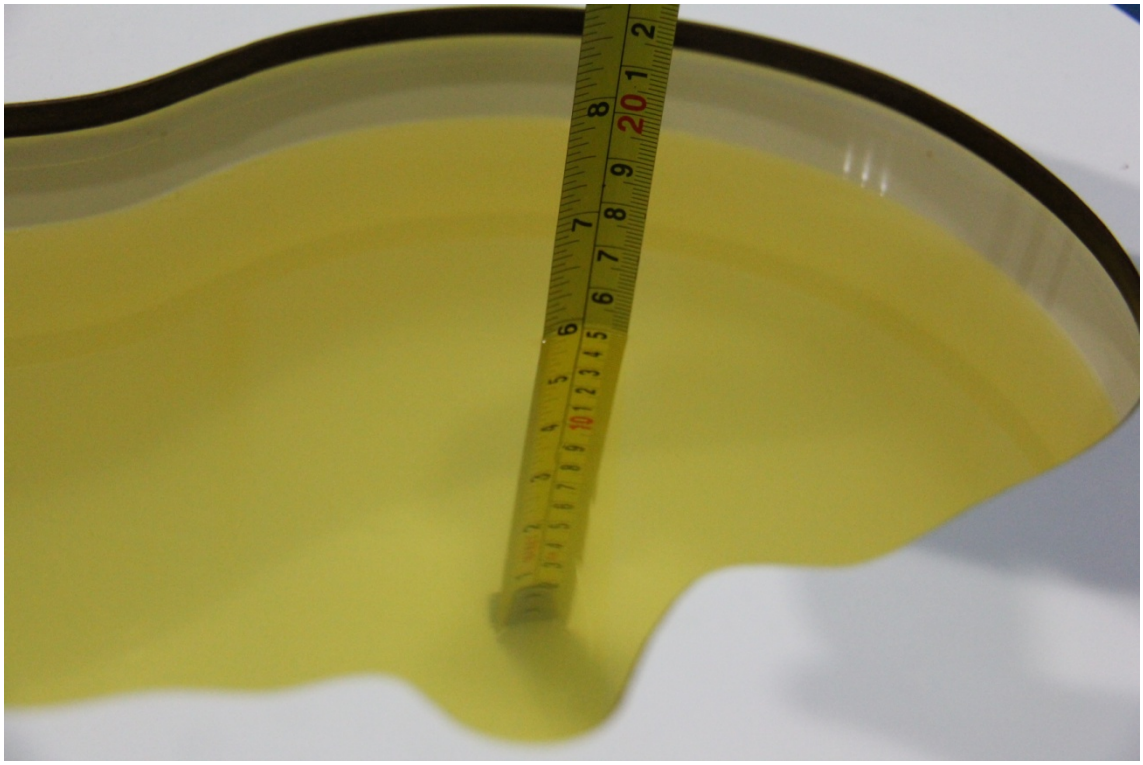
Note: The liquid temperature is 22.0°C



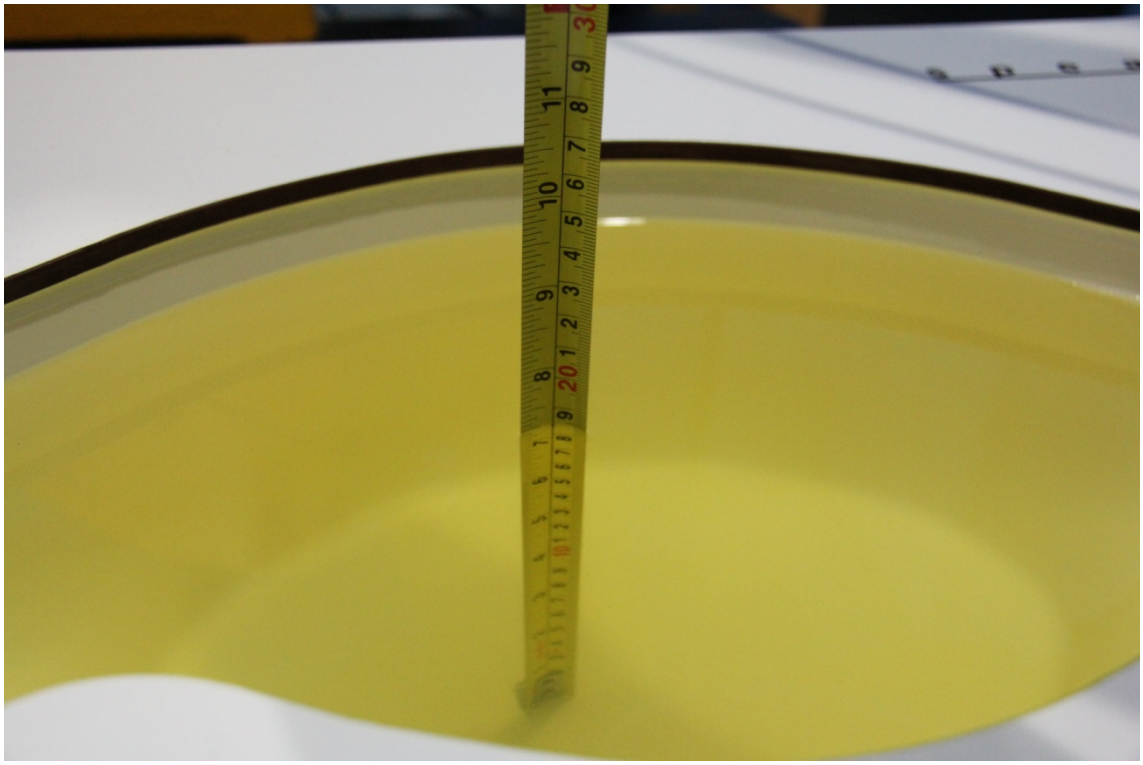
Picture 7-1 Liquid depth in the Head Phantom (835MHz)



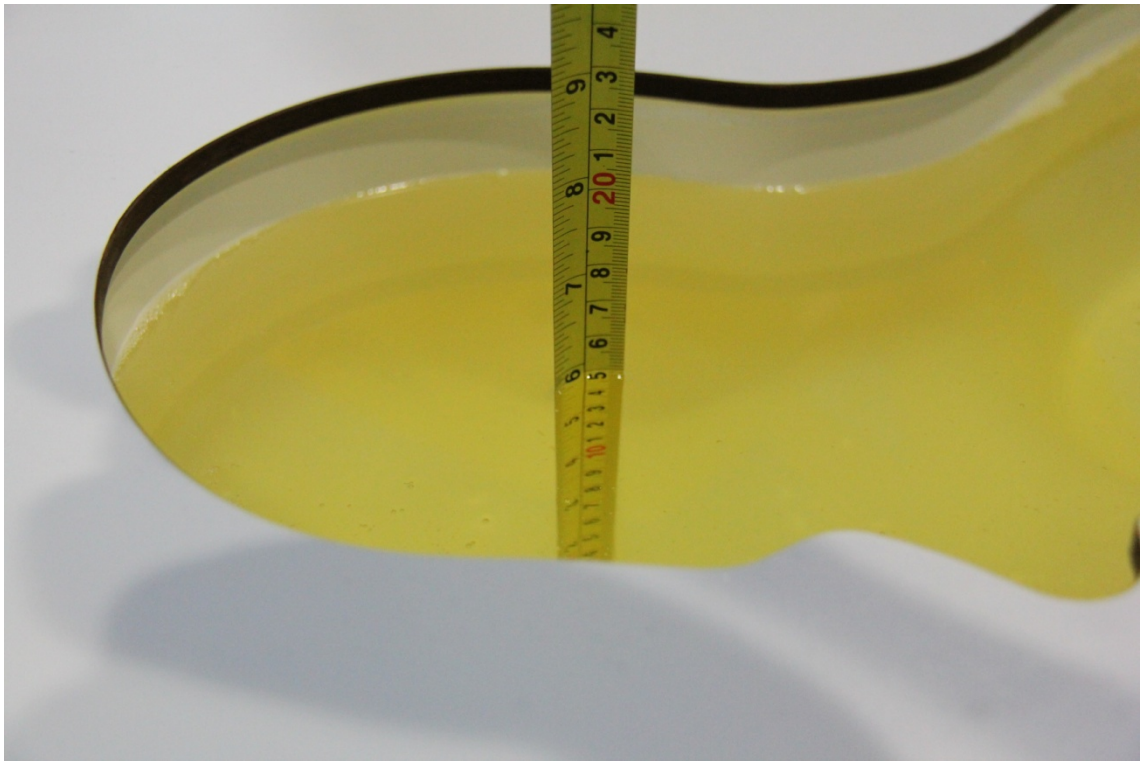
Picture 7-2 Liquid depth in the Flat Phantom (835MHz)



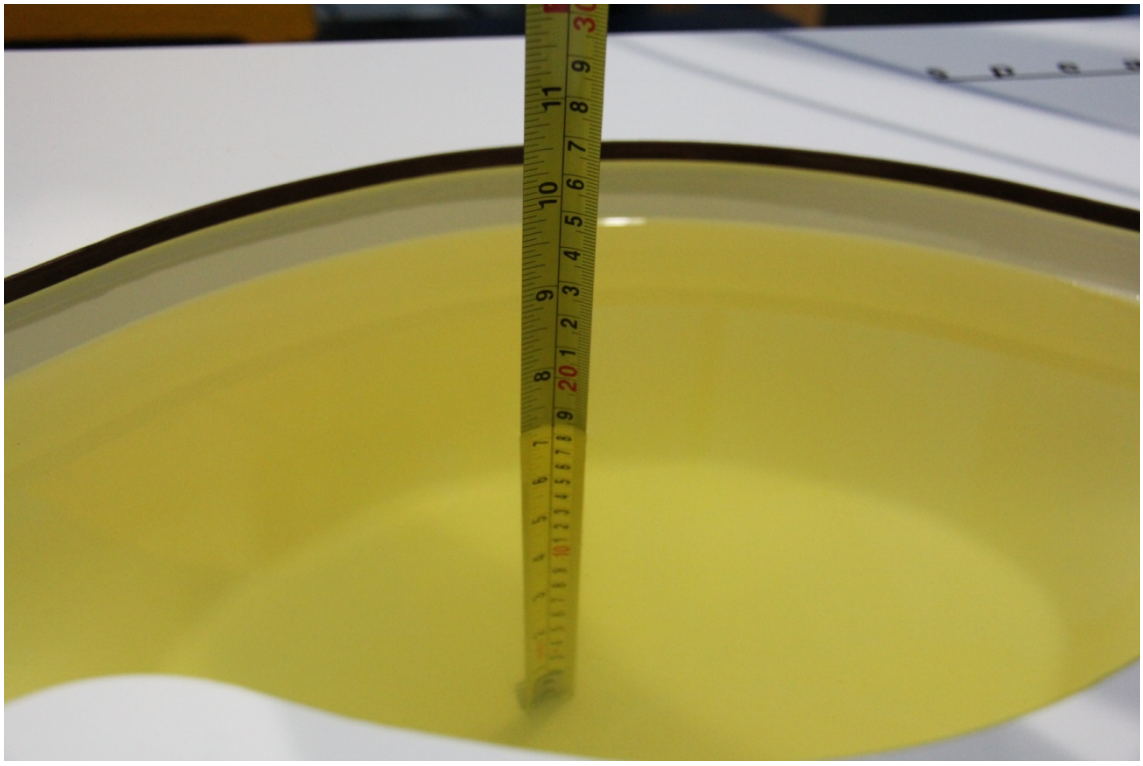
Picture 7-3 Liquid depth in the Head Phantom (1900 MHz)



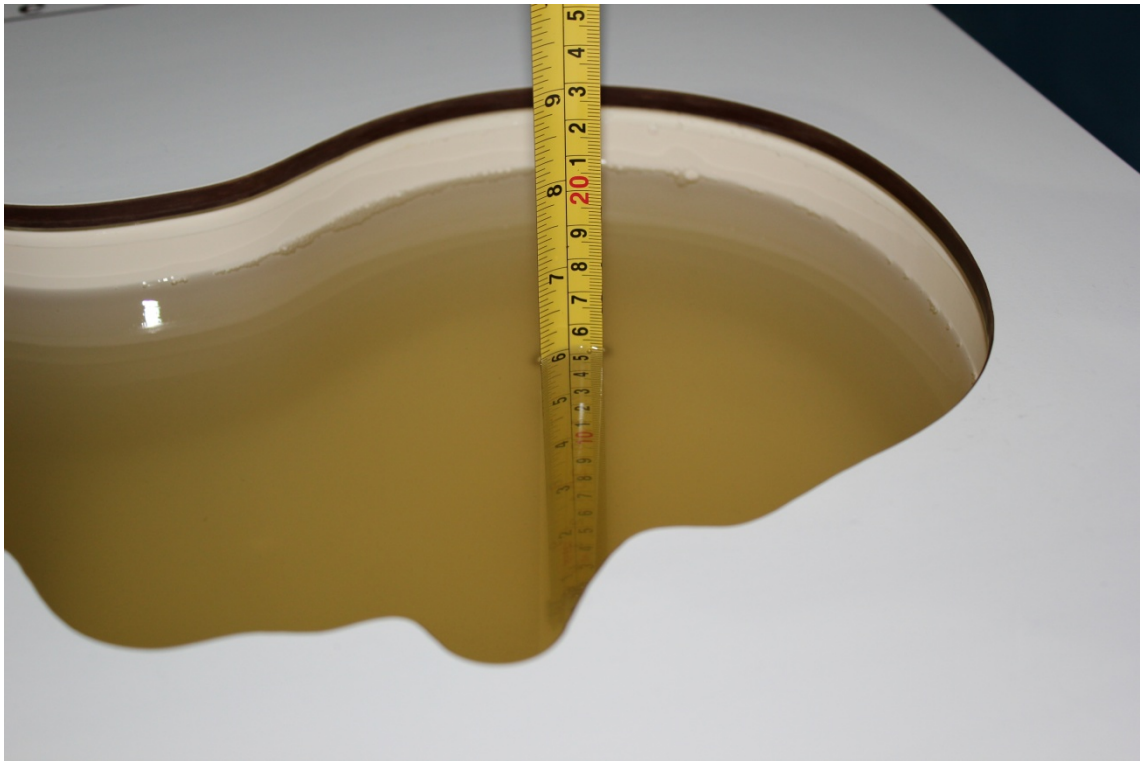
Picture 7-4 Liquid depth in the Flat Phantom (1900MHz)



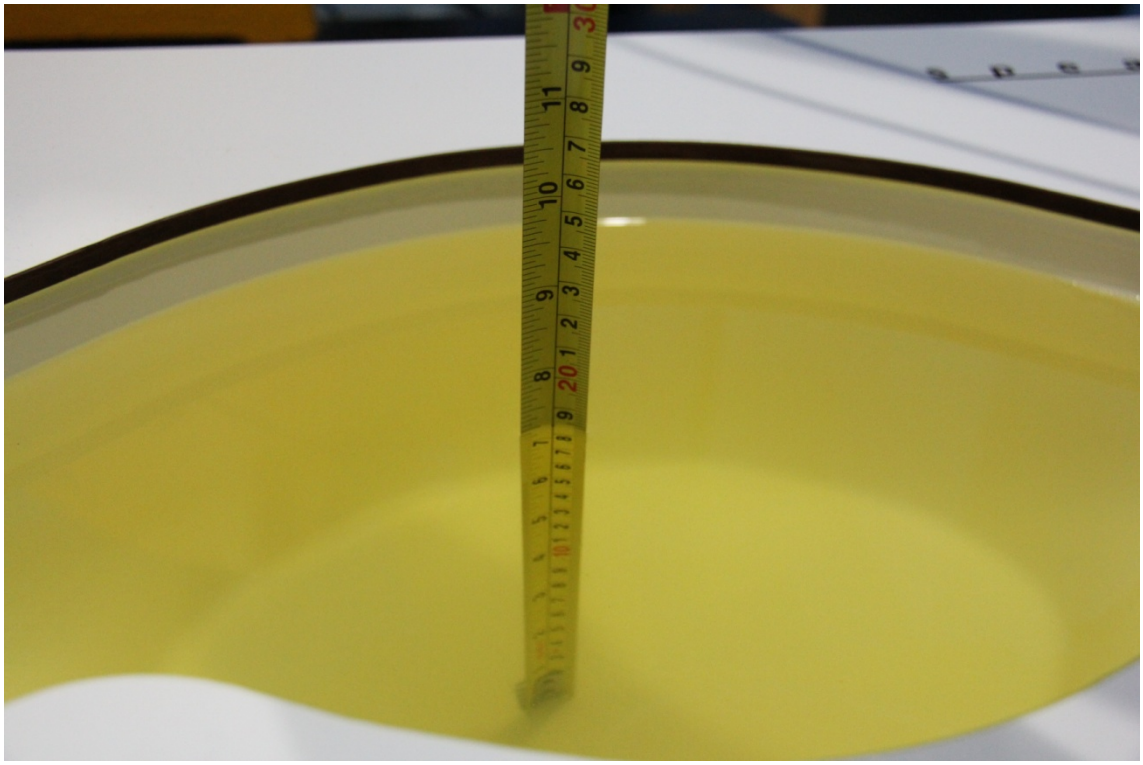
Picture 7-5 Liquid depth in the Head Phantom (2450MHz)



Picture 7-6 Liquid depth in the Flat Phantom (2450MHz)



Picture 7-7 Liquid depth in the Head Phantom (2600 MHz Head)

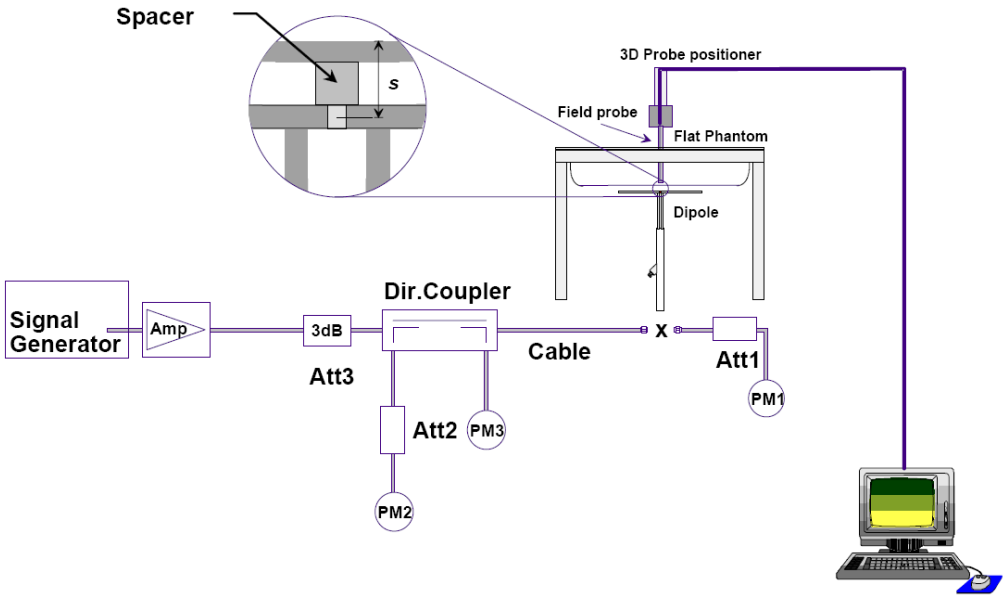


Picture 7-8 Liquid depth in the Flat Phantom (2600MHz)

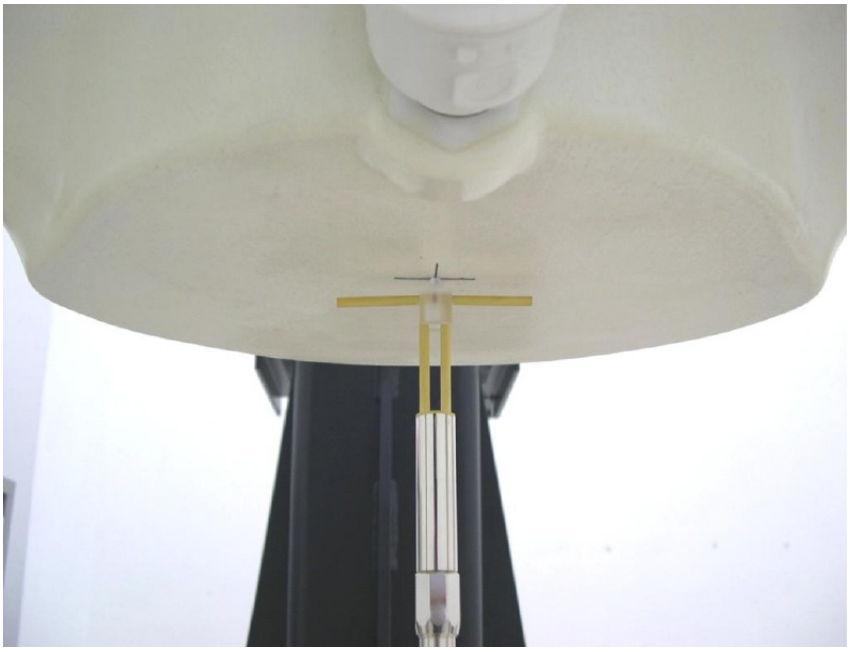
8 System verification

8.1 System Setup

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



Picture 8.1 System Setup for System Evaluation



Picture 8.2 Photo of Dipole Setup

8.2 System Verification

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device.

The system verification results are required that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR. The details are presented in annex B.

Table 8.1: System Verification of Head

Measurement Date (yyyy-mm-dd)	Frequency	Target value (W/kg)		Measured value(W/kg)		Deviation	
		10 g Average	1 g Average	10 g Average	1 g Average	10 g Average	1 g Average
2015-3-14	835 MHz	6.17	9.43	6.32	9.60	2.43%	1.80%
2015-3-16	1900 MHz	21.1	40.6	21.16	39.76	0.28%	-2.07%
2015-3-18	2450 MHz	24.7	53.2	24.52	52.40	-0.73%	-1.50%
2015-3-17	2600 MHz	25.9	57.8	25.52	56.40	-1.47%	-2.42%
2015-4-08	835 MHz	6.17	9.43	6.40	9.84	3.73%	4.35%

Table 8.2: System Verification of Body

Measurement Date (yyyy-mm-dd)	Frequency	Target value (W/kg)		Measured value (W/kg)		Deviation	
		10 g Average	1 g Average	10 g Average	1 g Average	10 g Average	1 g Average
2015-3-14	835 MHz	6.33	9.55	6.36	9.80	0.47%	2.62%
2015-3-16	1900 MHz	21.4	40.4	21.64	40.80	1.12%	0.99%
2015-3-18	2450 MHz	23.9	51.3	23.52	50.00	-1.59%	-2.53%
2015-3-17	2600 MHz	25.4	57.2	25.96	58.00	2.20%	1.40%
2015-4-08	835 MHz	6.33	9.55	6.16	9.48	-2.69%	-0.73%

9 Measurement Procedures

9.1 Tests to be performed

In order to determine the highest value of the peak spatial-average SAR of a handset, all device positions, configurations and operational modes shall be tested for each frequency band according to steps 1 to 3 below. A flowchart of the test process is shown in picture 9.1.

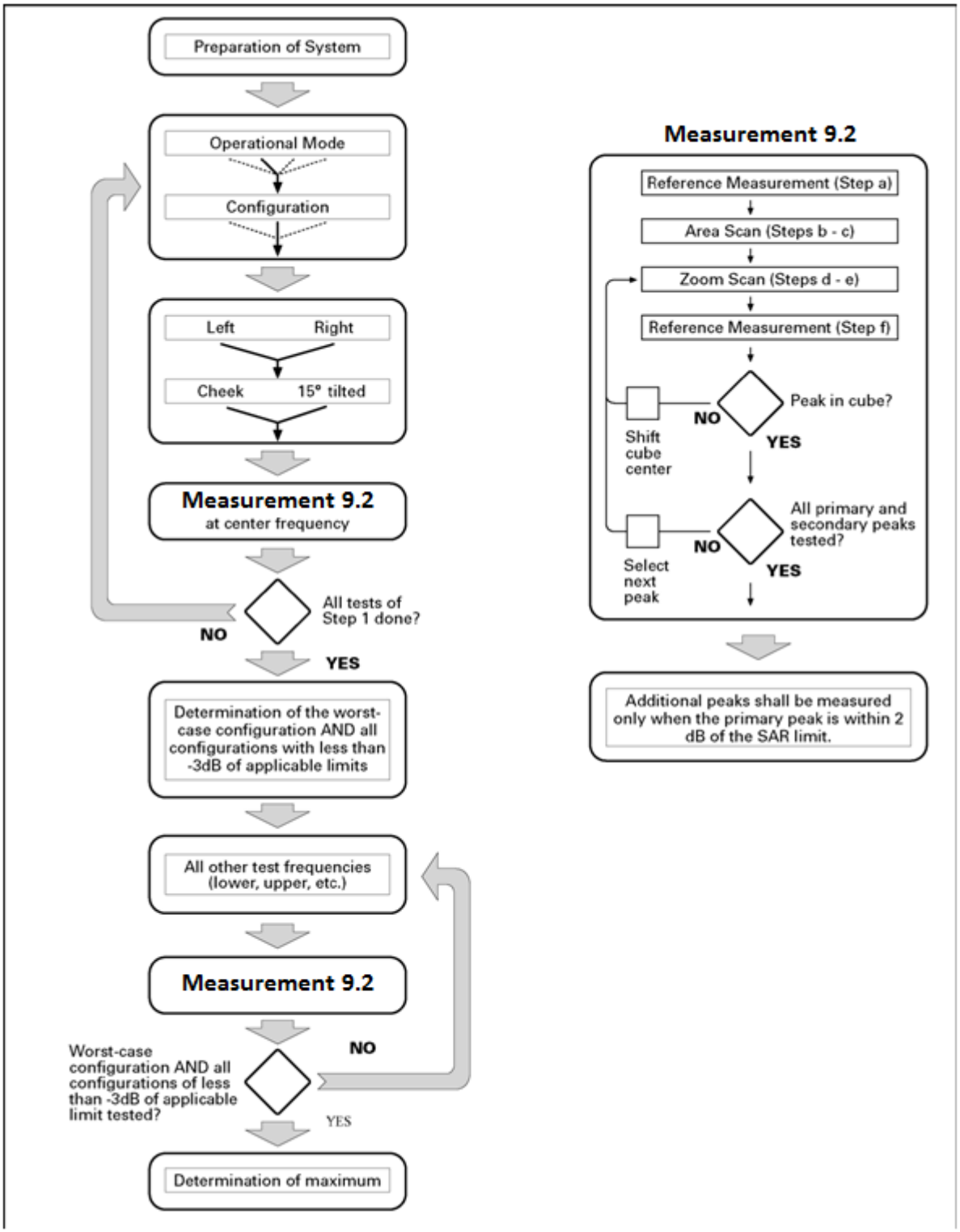
Step 1: The tests described in 9.2 shall be performed at the channel that is closest to the centre of the transmit frequency band (f_c) for:

a) all device positions (cheek and tilt, for both left and right sides of the SAM phantom, as described in annex D),
b) all configurations for each device position in a), e.g., antenna extended and retracted, and
c) all operational modes, e.g., analogue and digital, for each device position in a) and configuration in b) in each frequency band.

If more than three frequencies need to be tested according to 11.1 (i.e., N_c > 3), then all frequencies, configurations and modes shall be tested for all of the above test conditions.

Step 2: For the condition providing highest peak spatial-average SAR determined in Step 1,perform all tests described in 9.2 at all other test frequencies, i.e., lowest and highest frequencies. In addition, for all other conditions (device position, configuration and operational mode) where the peak spatial-average SAR value determined in Step 1 is within3 dB of the applicable SAR limit, it is recommended that all other test frequencies shall be tested as well.

Step 3: Examine all data to determine the highest value of the peak spatial-average SAR found in Steps 1 to 2.



Picture 9.1 Block diagram of the tests to be performed

9.2 General Measurement Procedure

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements and fully documented in SAR reports to qualify for TCB approval. Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe

tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2003. The results should be documented as part of the system validation records and may be requested to support test results when all the measurement parameters in the following table are not satisfied.

<table>
<tr><td colspan="3"></td><td>≤ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">≤ 1.5·$\Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</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 P1528-2011 for details.
* When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

9.3 WCDMA Measurement Procedures for SAR

The following procedures are applicable to WCDMA handsets operating under 3GPP Release99, Release 5 and Release 6. The default test configuration is to measure SAR with an established radio link between the DUT and a communication test set using a 12.2kbps RMC (reference measurement channel) configured in Test Loop Mode 1. SAR is selectively confirmed for other

physical channel configurations (DPCCH & $DPDCH_n$), HSDPA and HSPA (HSUPA/HSDPA) modes according to output power, exposure conditions and device operating capabilities. Both uplink and downlink should be configured with the same RMC or AMR, when required. SAR for Release 5 HSDPA and Release 6 HSPA are measured using the applicable FRC (fixed reference channel) and E-DCH reference channel configurations. Maximum output power is verified according to applicable versions of 3GPP TS 34.121 and SAR must be measured according to these maximum output conditions. When Maximum Power Reduction (MPR) is not implemented according to Cubic Metric (CM) requirements for Release 6 HSPA, the following procedures do not apply.

For Release 5 HSDPA Data Devices:

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}	CM/dB
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15	15/15	64	12/15	24/25	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

For Release 6 HSPA Data Devices

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM (dB)	MPR (dB)	AG Index	E-TFCI
1	11/15	15/15	64	11/15	22/15	209/225	1039/225	4	1	0.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	12/15	4	1	2.0	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	1.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	4/15	56/75	4	1	2.0	2.0	17	71
5	15/15	15/15	64	15/15	24/15	30/15	134/15	4	1	0.0	0.0	21	81

Rel.8 DC-HSDPA (Cat 24)

SAR test exclusion for Rel.8 DC-HSDPA must satisfy the SAR test exclusion requirements of Rel.5 HSDPA. SAR test exclusion for DC-HSDPA devices is determined by power measurements according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to qualify for SAR test exclusion.

9.4 SAR Measurement for LTE

SAR tests for LTE are performed with a base station simulator, Rohde & Rchwarz CMW500. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. All powers were measured with the CMW 500.

It is performed for conducted power and SAR based on the KDB941225 D05.

SAR is evaluated separately according to the following procedures for the different test positions in each exposure condition – head, body, body-worn accessories and other use conditions. The procedures in the following subsections are applied separately to test each LTE frequency band.

1) QPSK with 1 RB allocation
   Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.
2) QPSK with 50% RB allocation
   The procedures required for 1 RB allocation in 1) are applied to measure the SAR for QPSK with 50% RB allocation.
3) QPSK with 100% RB allocation
   For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in 1) and 2) are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

9.5 Bluetooth & Wi-Fi Measurement Procedures for SAR

Normal network operating configurations are not suitable for measuring the SAR of 802.11 transmitters in general. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure that the results are consistent and reliable.
Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in a test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

9.6 Power Drift

To control the output power stability during the SAR test, DASY4 system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in Table 14.2 to Table 14.31 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

10 Area Scan Based 1-g SAR

10.1 Requirement of KDB

According to the KDB447498 D01 v05, when the implementation is based the specific polynomial fit algorithm as presented at the 29th Bioelectromagnetics Society meeting (2007) and the estimated 1-gSAR is ≤ 1.2 W/kg, a zoom scan measurement is not required provided it is also not needed for any other purpose; for example, if the peak SAR location required for simultaneous transmission SAR test exclusion can be determined accurately by the SAR system or manually to discriminate between distinctive peaks and scattered noisy SAR distributions from area scans.

There must not be any warning or alert messages due to various measurement concerns identified by the SAR system; for example, noise in measurements, peaks too close to scan boundary, peaks are too sharp, spatial resolution and uncertainty issues etc. The SAR system verification must also demonstrate that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR (See Annex B). When all the SAR results for each exposure condition in a frequency band and wireless mode are based on estimated 1-g SAR, the 1-g SAR for the highest SAR configuration must be determined by a zoom scan.

10.2 Fast SAR Algorithms

The approach is based on the area scan measurement applying a frequency dependent attenuation parameter. This attenuation parameter was empirically determined by analyzing a large number of phones. The MOTOROLA FAST SAR was developed and validated by the MOTOROLA Research Group in Ft. Lauderdale.

In the initial study, an approximation algorithm based on Linear fit was developed. The accuracy of the algorithm has been demonstrated across a broad frequency range (136-2450 MHz)and for both 1- and 10-g averaged SAR using a sample of 264 SAR measurements from 55wireless handsets. For the sample size studied, the root-mean-squared errors of the algorithmare 1.2% and 5.8% for 1- and 10-g averaged SAR, respectively. The paper describing the algorithm in detail is expected to be published in August 2004 within the Special Issue of Transactions on MTT.

In the second step, the same research group optimized the fitting algorithm to an Polynomial fit whereby the frequency validity was extended to cover the range 30-6000MHz. Details ofthis study can be found in the BEMS 2007 Proceedings.

Both algorithms are implemented in DASY software.

11 Conducted Output Power

When WLAN Hotspot mode is activated (AP ON), in all operating modes, the conducted output power will be reduced for LTE Band 7. When WLAN Hotspot mode is deactivated (AP OFF), the RF output power level return to their normal RF power level.

11.1 Manufacturing tolerance

When the hotspot mode is ON:

Table 11.1: LTE

Mode	BW(MHz)	Target (dBm)	Tune-up(dBm)
LTE Band 7	5MHz-15MHz	16	17
	20MHz	18	19

Note: When the hotspot mode is ON, MPR settings doesn't work.

When the hotspot mode is OFF:

Table 11.2: GSM Speech

GSM 850			
Channel	Channel 251	Channel 190	Channel 128
Target (dBm)	33	33	33
Tune-up(dBm)	34	34	34
GSM 1900			
Channel	Channel 810	Channel 661	Channel 512
Target (dBm)	30	30	30
Tune-up(dBm)	31	31	31

Table 11.3: GPRS and EGPRS

GSM 850 GPRS (GMSK)				
Channel		**251**	**190**	**128**
1 Txslot	Target (dBm)	33	33	33
	Tune-up(dBm)	34	34	34
2 Txslots	Target (dBm)	30	30	30
	Tune-up(dBm)	31	31	31
3 Txslots	Target (dBm)	28.5	28.5	28.5
	Tune-up(dBm)	29.5	29.5	29.5
4 Txslots	Target (dBm)	27.5	27.5	27.5
	Tune-up(dBm)	28.5	28.5	28.5
GSM 850 EGPRS (GMSK)				
Channel		**251**	**190**	**128**
1 Txslot	Target (dBm)	33	33	33
	Tune-up(dBm)	34	34	34
2 Txslots	Target (dBm)	30	30	30
	Tune-up(dBm)	31	31	31
3 Txslots	Target (dBm)	28.5	28.5	28.5
	Tune-up(dBm)	29.5	29.5	29.5

4 Txslots	Target (dBm)	27.5	27.5	27.5
	Tune-up(dBm)	28.5	28.5	28.5
GSM 1900 GPRS (GMSK)				
Channel		**810**	**661**	**512**
1 Txslot	Target (dBm)	30	30	30
	Tune-up(dBm)	31	31	31
2 Txslots	Target (dBm)	27	27	27
	Tune-up(dBm)	28	28	28
3 Txslots	Target (dBm)	25.2	25.2	25.2
	Tune-up(dBm)	26.2	26.2	26.2
4 Txslots	Target (dBm)	24	24	24
	Tune-up(dBm)	25	25	25
GSM 1900 EGPRS (GMSK)				
Channel		**810**	**661**	**512**
1 Txslot	Target (dBm)	30	30	30
	Tune-up(dBm)	31	31	31
2 Txslots	Target (dBm)	27	27	27
	Tune-up(dBm)	28	28	28
3 Txslots	Target (dBm)	25.2	25.2	25.2
	Tune-up(dBm)	26.2	26.2	26.2
4 Txslots	Target (dBm)	24	24	24
	Tune-up(dBm)	25	25	25

Table 11.4: WCDMA

WCDMA 850 CS			
Channel	Channel 4233	Channel 4182	Channel 4132
Target (dBm)	22.9	22.9	22.9
Tune-up(dBm)	23.9	23.9	23.9
HSUPA (sub-test 1)			
Channel	Channel 4233	Channel 4182	Channel 4132
Target (dBm)	21.9	21.9	21.9
Tune-up(dBm)	22.9	22.9	22.9
HSUPA (sub-test 2/4)			
Channel	Channel 4233	Channel 4182	Channel 4132
Target (dBm)	19.9	19.9	19.9
Tune-up(dBm)	20.9	20.9	20.9
HSUPA (sub-test 3/5)			
Channel	Channel 4233	Channel 4182	Channel 4132
Target (dBm)	22.4	22.4	22.4
Tune-up(dBm)	23.4	23.4	23.4
HSDPA / DC-HSDPA (sub-test 1~4)			
Channel	Channel 4233	Channel 4182	Channel 4132
Target (dBm)	23	23	23
Tune-up(dBm)	24	24	24

Table 11.5: LTE

Mode	BW(MHz)	Target (dBm)	Tune-up(dBm)
LTE Band 5	1.4MHz-10MHz	22.4	23.4
LTE Band 7	5MHz-15MHz	22	23
	20MHz	23	24

LTE MPR will follow up 3GPP setting as below:

Modulation	Channel bandwidth / Transmission bandwidth (NRB)						MPR (dB)
	1.4MHz	3.0MHz	5MHz	10MHz	15MHz	20MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	2

Table 11.6: Bluetooth

Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	6	8	8.5
Tune-up(dBm)	7	9	9.5

Table 11.7: WiFi

Mode	Target (dBm)	Tune-up(dBm)
802.11b 1Mbps~5.5Mbps	17	18
802.11b 11Mbps	18	19
802.11g 6Mbps&12Mbps~36Mbps	19	20
802.11g 9Mbps	18.5	19.5
802.11g 48Mbps	17	18
802.11g 54Mbps	16	17
802.11n	16	17

11.2 Hotspot

There is power reduction for LTE Band 7. The power reduction is enabled when the user enables hotspot mode via the manufacturer software. The tables below show the measured powers with hotspot.

Table 11.8: The conducted Power for LTE

Band 7							
Bandwidth (MHz)	RB allocation RB offset (Start RB)	Frequency (MHz)	Max. Target Power (dBm)	QPSK		16QAM	
				Actual output power (dBm)	MPR	Actual output power (dBm)	MPR
5 MHz	1RB High (24)	2567.5	17	16.51	0	16.65	0
		2535	17	16.55	0	16.58	0
		2502.5	17	16.20	0	16.20	0
	1RB Middle (12)	2567.5	17	16.11	0	16.80	0
		2535	17	16.08	0	16.37	0
		2502.5	17	16.66	0	16.68	0
	1RB Low (0)	2567.5	17	16.56	0	16.66	0
		2535	17	16.53	0	16.51	0
		2502.5	17	15.73	0	15.74	0

	12RB High (13)	2567.5	17	15.81	0	15.89	0
		2535	17	15.69	0	15.77	0
		2502.5	17	15.41	0	15.50	0
	12RB Middle (6)	2567.5	17	16.33	0	16.38	0
		2535	17	16.28	0	16.32	0
		2502.5	17	15.83	0	15.85	0
	12RB Low (0)	2567.5	17	15.86	0	15.94	0
		2535	17	15.88	0	15.93	0
		2502.5	17	15.22	0	15.28	0
	25RB (0)	2567.5	17	15.96	0	15.96	0
		2535	17	15.83	0	15.84	0
		2502.5	17	15.64	0	15.66	0
10 MHz	1RB High (49)	2565	17	16.04	0	16.20	0
		2535	17	16.14	0	16.25	0
		2505	17	15.97	0	16.20	0
	1RB Middle (24)	2565	17	16.35	0	16.37	0
		2535	17	16.91	0	16.10	0
		2505	17	16.54	0	16.62	0
	1RB Low (0)	2565	17	16.46	0	16.61	0
		2535	17	16.47	0	16.56	0
		2505	17	16.27	0	16.46	0
	25RB High (25)	2565	17	15.60	0	15.68	0
		2535	17	15.21	0	15.25	0
		2505	17	15.07	0	15.12	0
	25RB Middle (12)	2565	17	16.03	0	16.02	0
		2535	17	16.00	0	15.98	0
		2505	17	15.79	0	15.82	0
	25RB Low (0)	2565	17	15.87	0	15.93	0
		2535	17	15.57	0	15.61	0
		2505	17	15.17	0	15.21	0
	50RB (0)	2565	17	15.55	0	15.56	0
		2535	17	15.73	0	15.74	0
		2505	17	15.44	0	15.48	0
15 MHz	1RB High (74)	2562.5	17	16.49	0	16.70	0
		2535	17	16.39	0	16.63	0
		2507.5	17	16.63	0	16.80	0
	1RB Middle (37)	2562.5	17	16.21	0	16.38	0
		2535	17	16.10	0	16.50	0
		2507.5	17	16.65	0	16.78	0
	1RB Low (0)	2562.5	17	16.82	0	16.00	0
		2535	17	16.11	0	16.24	0
		2507.5	17	16.56	0	16.74	0

	36RB High (38)	2562.5	17	15.77	0	15.81	0
		2535	17	15.67	0	15.78	0
		2507.5	17	15.72	0	15.83	0
	36RB Middle (19)	2562.5	17	15.88	0	15.91	0
		2535	17	15.88	0	15.93	0
		2507.5	17	15.87	0	15.93	0
	36RB Low (0)	2562.5	17	15.99	0	16.06	0
		2535	17	15.79	0	15.84	0
		2507.5	17	15.42	0	15.50	0
	75RB (0)	2562.5	17	15.82	0	15.82	0
		2535	17	15.88	0	15.89	0
		2507.5	17	15.57	0	15.59	0
20 MHz	1RB High (99)	2560	19	17.38	0	17.32	0
		2535	19	17.45	0	17.48	0
		2510	19	17.88	0	17.90	0
	1RB Middle (50)	2560	19	18.03	0	18.12	0
		2535	19	17.86	0	17.87	0
		2510	19	18.20	0	18.28	0
	1RB Low (0)	2560	19	18.28	0	18.39	0
		2535	19	18.11	0	18.17	0
		2510	19	18.17	0	18.26	0
	50RB High (50)	2560	19	17.58	0	17.47	0
		2535	19	17.43	0	17.34	0
		2510	19	18.33	0	18.26	0
	50RB Middle (25)	2560	19	17.47	0	17.42	0
		2535	19	17.54	0	17.47	0
		2510	19	18.01	0	17.98	0
	50RB Low (0)	2560	19	17.87	0	17.77	0
		2535	19	17.78	0	17.68	0
		2510	19	17.97	0	17.85	0
	100RB (0)	2560	19	17.49	0	17.42	0
		2535	19	17.60	0	17.49	0
		2510	19	18.07	0	17.99	0

11.3 GSM Measurement result

During the process of testing, the EUT was controlled via Agilent Digital Radio Communication tester (E5515C) to ensure the maximum power transmission and proper modulation. This result contains conducted output power for the EUT. In all cases, the measured peak output power should be greater and within 5% than EMI measurement.

Table 11.9: The conducted power measurement results for GSM850/1900

GSM 850MHz	Conducted Power (dBm)		
	Channel 251(848.8MHz)	Channel 190(836.6MHz)	Channel 128(824.2MHz)
	33.46	33.62	33.71
GSM 1900MHz	Conducted Power(dBm)		
	Channel 810(1909.8MHz)	Channel 661(1880MHz)	Channel 512(1850.2MHz)
	29.57	30.33	30.60

Table 11.10: The conducted power measurement results for GPRS and EGPRS

GSM 850 GPRS (GMSK)	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	251	**190**	**128**		**251**	**190**	**128**
1 Txslot	33.00	32.90	32.80	-9.03dB	23.97	23.87	23.77
2 Txslots	30.50	30.60	30.80	-6.02dB	24.48	24.58	24.78
3Txslots	28.60	28.80	29.20	-4.26dB	24.34	24.54	24.94
4 Txslots	27.90	28.10	28.40	-3.01dB	**24.89**	**25.09**	**25.39**
GSM 850 EGPRS (GMSK)	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	251	**190**	**128**		**251**	**190**	**128**
1 Txslot	32.99	32.89	32.79	-9.03dB	23.96	23.86	23.76
2 Txslots	30.48	30.57	30.78	-6.02dB	24.46	24.55	24.76
3Txslots	28.58	28.78	29.17	-4.26dB	24.32	24.52	24.91
4 Txslots	27.89	28.09	28.38	-3.01dB	**24.88**	**25.08**	**25.37**
PCS1900 GPRS (GMSK)	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	810	**661**	**512**		**810**	**661**	**512**
1 Txslot	29.90	30.30	30.40	-9.03dB	20.87	21.27	21.37
2 Txslots	27.10	27.50	27.30	-6.02dB	21.08	21.48	21.28
3Txslots	25.10	25.70	25.60	-4.26dB	20.84	21.44	21.34
4 Txslots	24.40	24.50	24.40	-3.01dB	**21.39**	**21.49**	**21.39**
PCS1900 EGPRS (GMSK)	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	810	**661**	**512**		**810**	**661**	**512**
1 Txslot	29.89	30.28	30.38	-9.03dB	20.86	21.25	21.35
2 Txslots	27.08	27.47	27.27	-6.02dB	21.06	21.45	21.25
3Txslots	25.07	25.69	25.58	-4.26dB	20.81	21.43	21.32
4 Txslots	24.39	24.48	24.39	-3.01dB	**21.38**	**21.47**	**21.38**

NOTES:

1) Division Factors

To average the power, the division factor is as follows:

1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB

2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB

3TX-slots = 3 transmit time slots out of 8 time slots=> conducted power divided by (8/3) => -4.26dB

4TX-slots = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.01dB

According to the conducted power as above, the body measurements are performed with 4Txslots for GPRS and EGPRS.

11.4 WCDMA Measurement result

Table 11.11: The conducted Power for WCDMA

Item	band	FDDV result		
	ARFCN	4233(846.6MHz)	4182(836.4MHz)	4132(826.4MHz)
WCDMA	\	23.24	23.46	23.40
HSDPA	1	22.77	23.01	22.81
	2	22.74	22.85	22.88
	3	22.72	22.83	22.86
	4	22.79	22.82	22.84
HSUPA	1	21.18	21.36	21.12
	2	19.10	19.82	19.22
	3	22.63	22.29	22.46
	4	19.99	19.61	19.97
	5	22.73	22.82	22.83
DC-HSDPA	1	22.85	22.98	23.03
	2	22.77	23.01	22.95
	3	22.75	22.97	22.91
	4	22.81	22.95	22.88

11.5 LTE Measurement result

Table 11.12: The conducted Power for LTE

Band 5							
Bandwidth (MHz)	RB allocation RB offset (Start RB)	Frequency (MHz)	Max. Target Power (dBm)	QPSK		16QAM	
				Actual output power (dBm)	MPR	Actual output power (dBm)	MPR
1.4 MHz	1RB High (5)	848.3	23.4	22.12	0	21.15	1
		836.5	23.4	22.09	0	21.16	1
		824.7	23.4	22.02	0	21.11	1
	1RB Middle (3)	848.3	23.4	22.21	0	21.29	1
		836.5	23.4	22.33	0	21.38	1
		824.7	23.4	22.12	0	21.16	1
	1RB Low (0)	848.3	23.4	22.00	0	21.08	1
		836.5	23.4	22.06	0	21.13	1
		824.7	23.4	21.46	0	20.59	1
	3RB High (3)	848.3	23.4	22.09	0	21.07	1
		836.5	23.4	22.13	0	21.13	1
		824.7	23.4	21.98	0	20.99	1

	3RB Middle (1)	848.3	23.4	22.09	0	21.09	1
		836.5	23.4	22.18	0	21.20	1
		824.7	23.4	21.93	0	20.94	1
	3RB Low (0)	848.3	23.4	22.03	0	21.07	1
		836.5	23.4	22.08	0	21.07	1
		824.7	23.4	21.84	0	20.83	1
	6RB (0)	848.3	23.4	21.10	1	20.04	2
		836.5	23.4	21.10	1	20.01	2
		824.7	23.4	20.90	1	19.85	2
3 MHz	1RB High (14)	847.5	23.4	22.20	0	21.04	1
		836.5	23.4	21.60	0	20.71	1
		825.5	23.4	22.02	0	21.11	1
	1RB Middle (7)	847.5	23.4	22.07	0	21.10	1
		836.5	23.4	22.22	0	21.31	1
		825.5	23.4	22.09	0	21.16	1
	1RB Low (0)	847.5	23.4	21.58	0	20.68	1
		836.5	23.4	21.92	0	21.01	1
		825.5	23.4	21.47	0	20.50	1
	8RB High (7)	847.5	23.4	21.07	1	20.03	2
		836.5	23.4	21.06	1	20.07	2
		825.5	23.4	21.06	1	20.06	2
	8RB Middle (4)	847.5	23.4	20.98	1	19.95	2
		836.5	23.4	21.06	1	19.99	2
		825.5	23.4	21.01	1	19.99	2
	8RB Low (0)	847.5	23.4	20.77	1	19.74	2
		836.5	23.4	20.94	1	19.88	2
		825.5	23.4	20.76	1	19.75	2
	15RB (0)	847.5	23.4	20.91	1	19.83	2
		836.5	23.4	20.94	1	19.86	2
		825.5	23.4	20.91	1	19.85	2
5 MHz	1RB High (24)	846.5	23.4	21.81	0	20.90	1
		836.5	23.4	21.73	0	20.49	1
		826.5	23.4	22.06	0	21.14	1
	1RB Middle (12)	846.5	23.4	22.35	0	21.47	1
		836.5	23.4	22.24	0	21.36	1
		826.5	23.4	22.23	0	21.29	1
	1RB Low (0)	846.5	23.4	21.42	0	20.44	1
		836.5	23.4	21.84	0	20.93	1
		826.5	23.4	21.49	0	20.47	1
	12RB High (13)	846.5	23.4	21.14	1	19.74	2
		836.5	23.4	20.82	1	19.81	2
		826.5	23.4	21.37	1	20.00	2

	12RB Middle (6)	846.5	23.4	21.27	1	19.85	2
		836.5	23.4	21.01	1	19.94	2
		826.5	23.4	21.45	1	20.05	2
	12RB Low (0)	846.5	23.4	20.97	1	19.56	2
		836.5	23.4	20.91	1	19.85	2
		826.5	23.4	21.09	1	20.05	2
	25RB (0)	846.5	23.4	21.04	1	19.62	2
		836.5	23.4	20.86	1	19.82	2
		826.5	23.4	21.23	1	19.82	2
10 MHz	1RB High (49)	844.0	23.4	21.51	0	20.65	1
		836.5	23.4	21.50	0	20.55	1
		829.0	23.4	21.70	0	20.93	1
	1RB Middle (24)	844.0	23.4	22.26	0	21.28	1
		836.5	23.4	22.56	0	21.64	1
		829.0	23.4	22.76	0	21.99	1
	1RB Low (0)	844.0	23.4	22.05	0	21.10	1
		836.5	23.4	22.37	0	21.67	1
		829.0	23.4	22.00	0	21.14	1
	25RB High (25)	844.0	23.4	20.93	1	19.92	2
		836.5	23.4	21.11	1	20.10	2
		829.0	23.4	21.27	1	20.27	2
	25RB Middle (12)	844.0	23.4	21.22	1	20.11	2
		836.5	23.4	21.25	1	20.18	2
		829.0	23.4	21.40	1	20.35	2
	25RB Low (0)	844.0	23.4	21.13	1	20.09	2
		836.5	23.4	21.27	1	20.26	2
		829.0	23.4	21.12	1	20.07	2
	50RB (0)	844.0	23.4	21.08	1	20.07	2
		836.5	23.4	21.11	1	20.08	2
		829.0	23.4	21.18	1	20.09	2
Band 7							
Bandwidth (MHz)	RB allocation RB offset (Start RB)	Frequency (MHz)	Max. Target Power (dBm)	QPSK		16QAM	
				Actual output power (dBm)	MPR	Actual output power (dBm)	MPR
5 MHz	1RB High (24)	2567.5	23	21.81	0	20.95	1
		2535	23	21.76	0	20.78	1
		2502.5	23	21.43	0	20.42	1
	1RB Middle (12)	2567.5	23	22.21	0	21.38	1
		2535	23	22.08	0	21.37	1
		2502.5	23	21.70	0	20.72	1
	1RB Low (0)	2567.5	23	21.82	0	20.92	1
		2535	23	21.75	0	20.74	1
		2502.5	23	21.01	0	20.02	1

	12RB High (13)	2567.5	23	20.96	1	20.04	2
		2535	23	20.80	1	19.88	2
		2502.5	23	20.53	1	19.62	2
	12RB Middle (6)	2567.5	23	21.41	1	20.46	2
		2535	23	21.34	1	20.37	2
		2502.5	23	20.97	1	19.98	2
	12RB Low (0)	2567.5	23	21.02	1	20.10	2
		2535	23	20.90	1	19.95	2
		2502.5	23	20.45	1	19.51	2
	25RB (0)	2567.5	23	21.18	1	20.18	2
		2535	23	21.10	1	20.12	2
		2502.5	23	20.73	1	19.74	2
10 MHz	1RB High (49)	2565	23	21.27	0	20.43	1
		2535	23	21.21	0	20.32	1
		2505	23	21.07	0	20.29	1
	1RB Middle (24)	2565	23	22.42	0	21.44	1
		2535	23	22.12	0	21.22	1
		2505	23	21.80	0	20.88	1
	1RB Low (0)	2565	23	21.71	0	20.86	1
		2535	23	21.77	0	20.86	1
		2505	23	21.33	0	20.53	1
	25RB High (25)	2565	23	20.76	1	19.84	2
		2535	23	20.50	1	19.54	2
		2505	23	20.37	1	19.42	2
	25RB Middle (12)	2565	23	21.04	1	20.03	2
		2535	23	21.06	1	20.05	2
		2505	23	20.81	1	19.83	2
	25RB Low (0)	2565	23	21.03	1	20.09	2
		2535	23	20.78	1	19.82	2
		2505	23	20.40	1	19.44	2
	50RB (0)	2565	23	20.84	1	19.85	2
		2535	23	20.84	1	19.84	2
		2505	23	20.60	1	19.63	2
15 MHz	1RB High (74)	2562.5	23	21.77	0	20.99	1
		2535	23	21.64	0	20.88	1
		2507.5	23	21.70	0	20.88	1
	1RB Middle (37)	2562.5	23	22.46	0	21.58	1
		2535	23	22.09	0	21.13	1
		2507.5	23	21.79	0	20.92	1
	1RB Low (0)	2562.5	23	22.01	0	21.18	1
		2535	23	22.27	0	21.40	1
		2507.5	23	21.83	0	21.01	1

	36RB High (38)	2562.5	23	20.98	1	20.02	2
		2535	23	20.74	1	19.85	2
		2507.5	23	20.73	1	19.84	2
	36RB Middle (19)	2562.5	23	21.12	1	20.15	2
		2535	23	21.17	1	20.21	2
		2507.5	23	21.01	1	20.07	2
	36RB Low (0)	2562.5	23	21.17	1	20.24	2
		2535	23	21.08	1	20.13	2
		2507.5	23	20.62	1	19.70	2
	75RB (0)	2562.5	23	20.94	1	19.93	2
		2535	23	21.01	1	20.02	2
		2507.5	23	20.80	1	19.82	2
20 MHz	1RB High (99)	2560	24	23.03	0	22.12	0.5
		2535	24	23.00	0	22.05	0.5
		2510	24	23.64	0	22.66	0.5
	1RB Middle (50)	2560	24	23.66	0	22.91	0.5
		2535	24	23.37	0	22.60	0.5
		2510	24	23.44	0	22.85	0.5
	1RB Low (0)	2560	24	23.54	0	22.87	0.5
		2535	24	23.91	0	23.00	0.5
		2510	24	23.32	0	22.64	0.5
	50RB High (50)	2560	24	22.44	1	21.71	1.5
		2535	24	22.10	1	21.49	1.5
		2510	24	22.97	1	21.99	1.5
	50RB Middle (25)	2560	24	22.37	1	21.67	1.5
		2535	24	22.30	1	21.63	1.5
		2510	24	22.68	1	21.99	1.5
	50RB Low (0)	2560	24	22.52	1	21.83	1.5
		2535	24	22.51	1	21.82	1.5
		2510	24	22.46	1	21.68	1.5
	100RB (0)	2560	24	22.33	1	21.62	1.5
		2535	24	22.32	1	21.62	1.5
		2510	24	22.66	1	21.90	1.5

11.6 Wi-Fi and BT Measurement result

The output power of BT antenna is as following:

Mode	Conducted Power (dBm)		
	Channel 0 (2402MHz)	Channel 39 (2441MHz)	Channel 78(2480MHz)
GFSK	6.52	7.98	8.94

The average conducted power for Wi-Fi is as following:

802.11b (dBm)

Channel\data rate	1Mbps	2Mbps	5.5Mbps	11Mbps
1	17.98	17.9	17.77	18.97
6	17.65	17.71	17.65	18.47
11	17.08	16.78	16.22	17.08

802.11g (dBm)

Channel\data rate	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
1	19.33	19.35	19.91	19.61	19.45	19.02	17.33	16.36
6	18.5	18.43	18.4	18.38	18.36	18.34	16.71	16.35
11	18.26	17.95	18.51	18.79	18.91	18.16	16.51	15.69

802.11n (dBm) - HT20 (2.4G)

Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
1	16.69	16.65	16.67	16.67	16.62	16.67	16.66	16.67
6	16.18	16.2	16.24	16.24	16.1	16.1	16.14	16.16
11	15.35	15.83	15.88	15.83	15.86	15.9	15.91	15.87

According to the KDB 248227 D01, SAR is measured for 2.4 GHz 802.11b DSSS using some fixed test positions with the highest measured maximum output power channel. When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.

SAR is not required for the following 2.4 GHz OFDM conditions.
1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
2) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

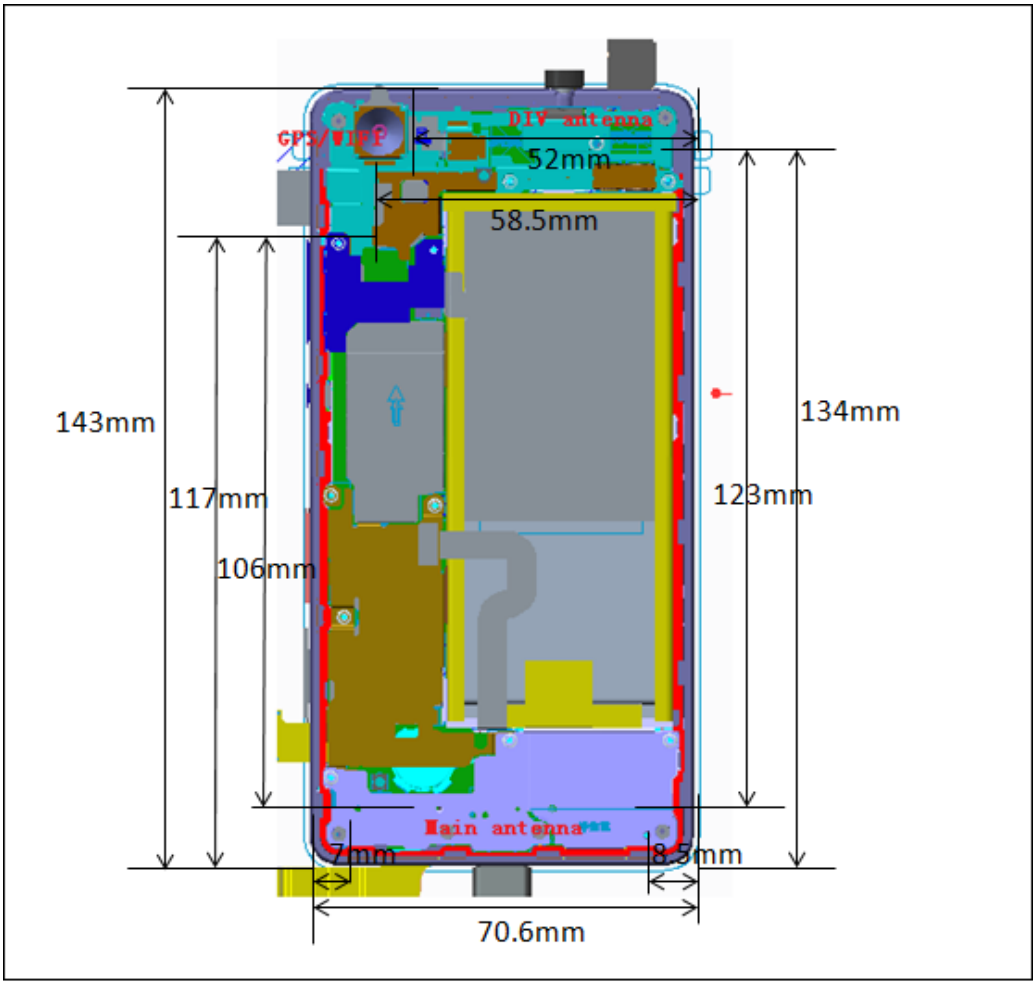
For this project, WLAN SAR is only measured with channel 1 of 11Mbps for 802.11b DSSS.

12 Simultaneous TX SAR Considerations

12.1 Introduction

The following procedures adopted from “FCC SAR Considerations for Cell Phones with Multiple Transmitters” are applicable to handsets with built-in unlicensed transmitters such as 802.11 a/b/g and Bluetooth devices which may simultaneously transmit with the licensed transmitter.
For this device, the BT and Wi-Fi can transmit simultaneous with other transmitters.

12.2 Transmit Antenna Separation Distances



Picture 12.1 Antenna Locations

12.3 SAR Measurement Positions

According to the KDB941225 D06 Hot Spot SAR v01, the edges with less than 2.5 cm distance to the antennas need to be tested for SAR.

SAR measurement positions						
Mode	Front	Rear	Left edge	Right edge	Top edge	Bottom edge
Main antenna	Yes	Yes	Yes	Yes	No	Yes
WLAN	Yes	Yes	No	Yes	Yes	No

12.4 Standalone SAR Test Exclusion Considerations

Standalone 1-g head or body SAR evaluation by measurement or numerical simulation is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied. The 1-g SAR test exclusion threshold for 100 MHz to 6 GHz at test separation distances≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, where

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

Table 12.1: Standalone SAR test exclusion considerations

Band/Mode	F(GHz)	Position	SAR test exclusion threshold(mW)	RF output power		SAR test exclusion
				dBm	mW	
Bluetooth	2.441	Head	9.60	9.5	8.91	Yes
		Body	19.20	9.5	8.91	Yes
2.4GHz WLAN 802.11 b	2.45	Head	9.58	19	79.43	No
		Body	19.17	19	79.43	No

13 Evaluation of Simultaneous

Table 13.1: The sum of reported SAR values for main antenna and WiFi

	Position	Main antenna	WiFi	Sum
Maximum reported SAR value for Head	Left hand, Touch cheek	0.75	0.09	**0.84**
Maximum reported SAR value for Body	Right Edge	0.68	0.03	**0.71**

Table 13.2: The sum of reported SAR values for main antenna and BT

	Position	Main antenna	BT[1]	Sum
Maximum reported SAR value for Head	Left hand, Touch cheek	0.75	0.37	**1.12**
Maximum reported SAR value for Body	Right Edge	0.68	0.19	**0.87**

[1] - Estimated SAR for Bluetooth (see the table 13.3)

Table 13.3: Estimated SAR for Bluetooth

Mode/Band	F (GHz)	Position	Distance (mm)	Upper limit of power *		Estimated$_{1g}$ (W/kg)
				dBm	mW	
Bluetooth	2.441	Head	5	9.5	8.91	0.37
Bluetooth	2.441	Body	10	9.5	8.91	0.19

* - Maximum possible output power declared by manufacturer

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
(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.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

Conclusion:
According to the above tables, the sum of reported SAR values is < 1.6W/kg. So the simultaneous transmission SAR with volume scans is not required.

14 SAR Test Result

It is determined by user manual for the distance between the EUT and the phantom bottom.
The distance is 10mm for AP ON and 15mm for AP OFF and just applied to the condition of body worn accessory.
It is performed for all SAR measurements with area scan based 1-g SAR estimation (Fast SAR). A zoom scan measurement is added when the estimated 1-gSAR is the highest measured SAR in each exposure configuration, wireless mode and frequency band combination or more than 1.2W/kg.
The calculated SAR is obtained by the following formula:

$$\text{Reported SAR} = \text{Measured SAR} \times 10^{(P_{Target}-P_{Measured})/10}$$

Where P_{Target} is the power of manufacturing upper limit;
$P_{Measured}$ is the measured power in chapter 11.

Table 14.1: Duty Cycle

Mode	Duty Cycle
Speech for GSM850/1900	1:8.3
GPRS&EGPRS	1:2
WCDMA & LTE & WiFi	1:1

14.1 The evaluation of multi-batteries

We'll perform the head measurement in all bands with the primary battery depending on the evaluation of multi-batteries and retest on highest value point with other batteries. Then, repeat the measurement in the Body test.

Table 14.2: The evaluation of multi-batteries for Head Test

Frequency		Mode/Band	Side	Test Position	Battery Type	SAR(1g)	Power Drift(dB)
MHz	Ch.					(W/kg)	
836.6	190	GSM850	Left	Touch	Battery for SCUD	0.336	0.04
836.6	190	GSM850	Left	Touch	Battery for Sunwoda	0.301	-0.03

Note: According to the values in the above table, the battery for SCUD is the primary battery. We'll perform the head measurement with this battery and retest on highest value point with others.

Table 14.3: The evaluation of multi-batteries for Body Test

Frequency		Mode/Band	Test Position	Spacing (mm)	Battery Type	SAR(1g)	Power Drift(dB)
MHz	Ch.					(W/kg)	
836.6	190	GSM850	Rear	10	Battery for SCUD	0.556	-0.10
836.6	190	GSM850	Rear	10	Battery for Sunwoda	0.495	0.06

Note: According to the values in the above table, the battery for SCUD is the primary battery. We'll perform the Body measurement with this battery and retest on highest value point with others.

14.2 SAR results for Fast SAR

Table 14.4: SAR Values (GSM 850 MHz Band - Head) with Battery for SCUD

Ambient Temperature: 22.4 °C Liquid Temperature: 22.0 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
836.6	190	Left	Touch	/	33.62	34.0	0.234	**0.26**	0.336	**0.37**	0.04
836.6	190	Left	Tilt	/	33.62	34.0	0.165	**0.18**	0.232	**0.25**	-0.02
848.8	251	Right	Touch	/	33.46	34.0	0.222	**0.25**	0.313	**0.35**	-0.01
836.6	190	Right	Touch	Fig.1	33.62	34.0	0.288	**0.31**	0.374	**0.41**	-0.04
824.2	128	Right	Touch	/	33.71	34.0	0.212	**0.23**	0.299	**0.32**	-0.05
836.6	190	Right	Tilt	/	33.62	34.0	0.190	**0.21**	0.269	**0.29**	-0.04

Table 14.5: SAR Values (GSM 850 MHz Band-Body) with Battery for SCUD

Ambient Temperature: 22.4 °C Liquid Temperature: 22.0 °C											
Frequency		Mode (number of timeslots)	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
836.6	190	GPRS (4)	Front	/	28.10	28.5	0.279	**0.31**	0.393	**0.43**	0.02
836.6	190	GPRS (4)	Rear	/	28.10	28.5	0.395	**0.43**	0.556	**0.61**	-0.10
836.6	190	GPRS (4)	Left	/	28.10	28.5	0.201	**0.22**	0.300	**0.33**	-0.02
848.8	251	GPRS (4)	Right	/	27.90	28.5	0.358	**0.41**	0.533	**0.61**	-0.06
836.6	190	GPRS (4)	Right	Fig.2	28.10	28.5	0.429	**0.47**	0.623	**0.68**	-0.02
824.2	128	GPRS (4)	Right	/	28.40	28.5	0.346	**0.35**	0.513	**0.52**	0.00
836.6	190	GPRS (4)	Bottom	/	28.10	28.5	0.045	**0.05**	0.076	**0.08**	-0.03
836.6	190	EGPRS (4)	Right	/	28.09	28.5	0.406	**0.45**	0.601	**0.66**	-0.09

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.6: SAR Values (GSM1900 MHz Band - Head) with Battery for SCUD

Ambient Temperature: 22.4 °C Liquid Temperature: 22.0 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
1909.8	810	Left	Touch	Fig.3	29.57	31.0	0.247	**0.34**	0.404	**0.56**	0.07
1880	661	Left	Touch	/	30.33	31.0	0.194	**0.23**	0.310	**0.36**	-0.08
1850.2	512	Left	Touch	/	30.60	31.0	0.189	**0.21**	0.321	**0.35**	0.06
1880	661	Left	Tilt	/	30.33	31.0	0.069	**0.08**	0.120	**0.14**	-0.18
1880	661	Right	Touch	/	30.33	31.0	0.147	**0.17**	0.251	**0.29**	0.16
1880	661	Right	Tilt	/	30.33	31.0	0.106	**0.12**	0.208	**0.24**	-0.06

Table 14.7: SAR Values (GSM 1900 MHz Band-Body) with Battery for SCUD

Ambient Temperature: 22.4 °C Liquid Temperature: 22.0 °C											
Frequency		Mode (number of timeslots)	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1880	661	GPRS (4)	Front	/	24.50	25.0	0.212	**0.24**	0.390	**0.44**	-0.01
1909.8	810	GPRS (4)	Rear	Fig.4	24.40	25.0	0.257	**0.30**	0.463	**0.53**	0.01
1880	661	GPRS (4)	Rear	/	24.50	25.0	0.240	**0.27**	0.439	**0.49**	-0.01
1850.2	512	GPRS (4)	Rear	/	24.40	25.0	0.223	**0.26**	0.430	**0.49**	-0.06
1880	661	GPRS (4)	Left	/	24.50	25.0	0.093	**0.10**	0.163	**0.18**	-0.08
1880	661	GPRS (4)	Right	/	24.50	25.0	0.087	**0.10**	0.151	**0.17**	-0.04
1880	661	GPRS (4)	Bottom	/	24.50	25.0	0.111	**0.12**	0.198	**0.22**	-0.08
1909.8	810	EGPRS (4)	Rear	/	24.39	25.0	0.257	**0.30**	0.462	**0.53**	0.16

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.8: SAR Values (WCDMA850 MHz Band - Head) with Battery for SCUD

Ambient Temperature: 22.4 °C Liquid Temperature: 22.0 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
836.4	4182	Left	Touch	/	23.46	23.9	0.181	**0.20**	0.256	**0.28**	0.02
836.4	4182	Left	Tilt	/	23.46	23.9	0.128	**0.14**	0.181	**0.20**	0.03
846.6	4233	Right	Touch	/	23.24	23.9	0.172	**0.20**	0.242	**0.28**	-0.09
836.4	4182	Right	Touch	Fig.5	23.46	23.9	0.207	**0.23**	0.267	**0.30**	-0.04
826.4	4132	Right	Touch	/	23.40	23.9	0.177	**0.20**	0.249	**0.28**	0.07
836.4	4182	Right	Tilt	/	23.46	23.9	0.137	**0.15**	0.192	**0.21**	-0.03

Table 14.9: SAR Values (WCDMA 850 MHz Band-Body) with Battery for SCUD

Ambient Temperature: 22.4 °C Liquid Temperature: 22.0 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.									
836.4	4182	Front	/	23.46	23.9	0.238	**0.26**	0.336	**0.37**	-0.01
846.6	4233	Rear	/	23.24	23.9	0.306	**0.36**	0.433	**0.50**	0.00
836.4	4182	Rear	Fig.6	23.46	23.9	0.362	**0.40**	0.465	**0.51**	-0.02
826.4	4132	Rear	/	23.40	23.9	0.311	**0.35**	0.438	**0.49**	-0.01
836.4	4182	Left	/	23.46	23.9	0.180	**0.20**	0.267	**0.30**	0.09
836.4	4182	Right	/	23.46	23.9	0.212	**0.23**	0.317	**0.35**	-0.18
836.4	4182	Bottom	/	23.46	23.9	0.055	**0.06**	0.101	**0.11**	-0.03

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.10: SAR Values (LTE Band5 - Head) with Battery for SCUD

Ambient Temperature: 22.6 °C												
Frequency		Mode	Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.											
829	20450	1RB_Mid	Left	Touch	/	22.76	23.4	0.134	**0.16**	0.194	**0.22**	0.12
829	20450	1RB_Mid	Left	Tilt	/	22.76	23.4	0.109	**0.13**	0.157	**0.18**	0.02
829	20450	1RB_Mid	Right	Touch	Fig.7	22.76	23.4	0.264	**0.31**	0.341	**0.40**	-0.12
829	20450	1RB_Mid	Right	Tilt	/	22.76	23.4	0.163	**0.19**	0.234	**0.27**	0.04
829	20450	25RB_Mid	Left	Touch	/	21.40	22.4	0.136	**0.17**	0.198	**0.25**	0.04
829	20450	25RB_Mid	Left	Tilt	/	21.40	22.4	0.131	**0.16**	0.212	**0.27**	-0.02
829	20450	25RB_Mid	Right	Touch	/	21.40	22.4	0.161	**0.20**	0.234	**0.29**	0.07
829	20450	25RB_Mid	Right	Tilt	/	21.40	22.4	0.109	**0.14**	0.156	**0.20**	-0.11

Note: The LTE mode is QPSK_10MHz.

Table 14.11: SAR Values (LTE Band5 -Body) with Battery for SCUD

Ambient Temperature: 22.6 °C											
Frequency		Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
829	20450	1RB_Mid	Front	/	22.76	23.4	0.270	**0.31**	0.382	**0.44**	-0.09
829	20450	1RB_Mid	Rear	Fig.8	22.76	23.4	0.408	**0.47**	0.517	**0.60**	-0.08
829	20450	1RB_Mid	Left	/	22.76	23.4	0.235	**0.27**	0.350	**0.41**	-0.03
829	20450	1RB_Mid	Right	/	22.76	23.4	0.266	**0.31**	0.395	**0.46**	0.01
829	20450	1RB_Mid	Bottom	/	22.76	23.4	0.035	**0.04**	0.065	**0.08**	-0.03
829	20450	25RB_Mid	Front	/	21.40	22.4	0.192	**0.24**	0.271	**0.34**	0.06
829	20450	25RB_Mid	Rear	/	21.40	22.4	0.248	**0.31**	0.352	**0.44**	0.18
829	20450	25RB_Mid	Left	/	21.40	22.4	0.172	**0.22**	0.255	**0.32**	0.04
829	20450	25RB_Mid	Right	/	21.40	22.4	0.198	**0.25**	0.294	**0.37**	0.05
829	20450	25RB_Mid	Bottom	/	21.40	22.4	0.025	**0.03**	0.047	**0.06**	0.03

Note1: The distance between the EUT and the phantom bottom is 10mm.

Note2: The LTE mode is QPSK_10MHz.

Table 14.12: SAR Values (LTE Band7 - Head) with Battery for SCUD

Ambient Temperature: 22.5 °C												
Frequency		Mode	Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.											
2535	21100	1RB_Low	Left	Touch	Fig.9	23.91	24.0	0.392	**0.40**	0.737	**0.75**	-0.06
2535	21100	1RB_Low	Left	Tilt	/	23.91	24.0	0.109	**0.11**	0.223	**0.23**	-0.01
2535	21100	1RB_Low	Right	Touch	/	23.91	24.0	0.210	**0.21**	0.384	**0.39**	0.06
2535	21100	1RB_Low	Right	Tilt	/	23.91	24.0	0.142	**0.14**	0.299	**0.31**	0.03
2510	20850	50RB_High	Left	Touch	/	22.97	23.0	0.266	**0.27**	0.497	**0.50**	0.10
2510	20850	50RB_High	Left	Tilt	/	22.97	23.0	0.064	**0.06**	0.130	**0.13**	0.11
2510	20850	50RB_High	Right	Touch	/	22.97	23.0	0.119	**0.12**	0.217	**0.22**	0.06
2510	20850	50RB_High	Right	Tilt	/	22.97	23.0	0.085	**0.09**	0.179	**0.18**	0.13

Note: The LTE mode is QPSK_20MHz.

Table 14.13: SAR Values (LTE Band7 -Body) with Battery for SCUD – AP OFF

Ambient Temperature: 22.5 °C											
Frequency		Mode	Test Positio n	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
2535	21100	1RB_Low	Front	/	23.91	24.0	0.331	**0.34**	0.610	**0.62**	-0.09
2535	21100	1RB_Low	Rear	Fig.10	23.91	24.0	0.328	**0.33**	0.631	**0.64**	-0.12
2510	20850	50RB_High	Front	/	22.97	23.0	0.133	**0.13**	0.315	**0.32**	0.15
2510	20850	50RB_High	Rear	/	22.97	23.0	0.206	**0.21**	0.394	**0.40**	0.19

Note1: The distance between the EUT and the phantom bottom is 15mm.

Note2: The LTE mode is QPSK_20MHz.

Table 14.14: SAR Values (LTE Band7 -Body) with Battery for SCUD – AP ON

Ambient Temperature: 22.5 °C											
Frequency		Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
2560	21350	1RB_Low	Front	/	18.28	19.0	0.170	**0.20**	0.323	**0.38**	0.16
2560	21350	1RB_Low	Rear	Fig.11	18.28	19.0	0.154	**0.18**	0.334	**0.39**	0.14
2560	21350	1RB_Low	Left	/	18.28	19.0	0.079	**0.09**	0.167	**0.20**	-0.18
2560	21350	1RB_Low	Right	/	18.28	19.0	0.014	**0.02**	0.036	**0.04**	-0.09
2560	21350	1RB_Low	Bottom	/	18.28	19.0	0.098	**0.12**	0.198	**0.23**	0.05
2510	20850	50RB_High	Front	/	18.33	19.0	0.110	**0.13**	0.216	**0.25**	-0.16
2510	20850	50RB_High	Rear	/	18.33	19.0	0.159	**0.19**	0.295	**0.34**	-0.13
2510	20850	50RB_High	Left	/	18.33	19.0	0.065	**0.08**	0.117	**0.14**	-0.04
2510	20850	50RB_High	Right	/	18.33	19.0	0.010	**0.01**	0.028	**0.03**	0.04
2510	20850	50RB_High	Bottom	/	18.33	19.0	0.062	**0.07**	0.127	**0.15**	-0.09

Note1: The distance between the EUT and the phantom bottom is 10mm.

Note2: The LTE mode is QPSK_20MHz.

Table 14.15: SAR Values (Wi-Fi 802.11b - Head) with Battery for SCUD

Ambient Temperature: 22.5 °C Liquid Temperature: 22.0 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
2412	1	Left	Touch	Fig.12	18.97	19.0	0.035	**0.04**	0.083	**0.09**	0.04
2412	1	Left	Tilt	/	18.97	19.0	0.010	**0.01**	0.030	**0.03**	0.13
2412	1	Right	Touch	/	18.97	19.0	0.016	**0.02**	0.033	**0.04**	0.06
2412	1	Right	Tilt	/	18.97	19.0	0.014	**0.02**	0.033	**0.04**	0.02

Note: The WiFi mode is 802.11b-11Mbps.

Table 14.16: SAR Values (Wi-Fi 802.11b - Body) with Battery for SCUD

Ambient Temperature: 22.5 °C Liquid Temperature: 22.0 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.									
2412	1	Front	/	18.97	19.0	0.006	**0.01**	0.016	**0.02**	-0.05
2412	1	Rear	/	18.97	19.0	0.012	**0.02**	0.024	**0.03**	0.06
2412	1	Right	Fig.13	18.97	19.0	0.010	**0.01**	0.025	**0.03**	0.06
2412	1	Top	/	18.97	19.0	0.004	**0.00**	0.009	**0.01**	0.07

Note1: The distance between the EUT and the phantom bottom is 10mm.
Note2: The WiFi mode is 802.11b-11Mbps.

Table 14.17: SAR Values (LTE Band7 - Head) with Battery for Sunwoda

Ambient Temperature: 22.5 °C Liquid Temperature: 22.0 °C												
Frequency		Mode	Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.											
2535	21100	1RB_Low	Left	Touch	/	23.91	24.0	0.357	**0.36**	0.662	**0.68**	-0.03

Note: The LTE mode is QPSK_20MHz.

Table 14.18: SAR Values (GSM 850 MHz Band-Body) with Battery for Sunwoda

Ambient Temperature: 22.4 °C Liquid Temperature: 22.0 °C											
Frequency		Mode (number of timeslots)	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
836.6	190	GPRS (4)	Right	/	28.10	28.5	0.407	**0.45**	0.581	**0.64**	0.05

Note1: The distance between the EUT and the phantom bottom is 10mm.

14.3 SAR results for Standard procedure

There is zoom scan measurement to be added for the highest measured SAR in each exposure configuration/band.

Table 14.19: SAR Values (GSM 850 MHz Band - Head) with Battery for SCUD

Ambient Temperature: 22.4 °C Liquid Temperature: 22.0 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
836.6	190	Right	Touch	Fig.1	33.62	34.0	0.288	**0.31**	0.374	**0.41**	-0.04

Table 14.20: SAR Values (GSM 850 MHz Band-Body) with Battery for SCUD

Ambient Temperature: 22.4 °C Liquid Temperature: 22.0 °C											
Frequency		Mode (number of timeslots)	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
836.6	190	GPRS (4)	Right	Fig.2	28.10	28.5	0.429	**0.47**	0.623	**0.68**	-0.02

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.21: SAR Values (GSM1900 MHz Band - Head) with Battery for SCUD

Ambient Temperature: 22.4 °C Liquid Temperature: 22.0 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
1909.8	810	Left	Touch	Fig.3	29.57	31.0	0.247	**0.34**	0.404	**0.56**	0.07

Table 14.22: SAR Values (GSM 1900 MHz Band-Body) with Battery for SCUD

Ambient Temperature: 22.4 °C Liquid Temperature: 22.0 °C											
Frequency		Mode (number of timeslots)	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1909.8	810	GPRS (4)	Rear	Fig.4	24.40	25.0	0.257	**0.30**	0.463	**0.53**	0.01

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.23: SAR Values (WCDMA850 MHz Band - Head) with Battery for SCUD

Ambient Temperature: 22.4 °C Liquid Temperature: 22.0 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
836.4	4182	Right	Touch	Fig.5	23.46	23.9	0.207	**0.23**	0.267	**0.30**	-0.04

Table 14.24: SAR Values (WCDMA 850 MHz Band-Body) with Battery for SCUD

Ambient Temperature: 22.4 °C Liquid Temperature: 22.0 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.									
836.4	4182	Rear	Fig.6	23.46	23.9	0.362	**0.40**	0.465	**0.51**	-0.02

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.25: SAR Values (LTE Band5 - Head) with Battery for SCUD

Ambient Temperature: 22.6 °C Liquid Temperature: 22.1 °C												
Frequency		Mode	Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.											
829	20450	1RB_Mid	Right	Touch	Fig.7	22.76	23.4	0.264	**0.31**	0.341	**0.40**	-0.12

Note: The LTE mode is QPSK_10MHz.

Table 14.26: SAR Values (LTE Band5 -Body) with Battery for SCUD

Ambient Temperature: 22.6 °C Liquid Temperature: 22.1 °C											
Frequency		Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
829	20450	1RB_Mid	Rear	Fig.8	22.76	23.4	0.408	**0.47**	0.517	**0.60**	-0.08

Note1: The distance between the EUT and the phantom bottom is 10mm.
Note2: The LTE mode is QPSK_10MHz.

Table 14.27: SAR Values (LTE Band7 - Head) with Battery for SCUD

Ambient Temperature: 22.5 °C Liquid Temperature: 22.0 °C												
Frequency		Mode	Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.											
2535	21100	1RB_Low	Left	Touch	Fig.9	23.91	24.0	0.392	**0.40**	0.737	**0.75**	-0.06

Note: The LTE mode is QPSK_20MHz.

Table 14.28: SAR Values (LTE Band7 -Body) with Battery for SCUD – AP OFF

Ambient Temperature: 22.5 °C Liquid Temperature: 22.0 °C											
Frequency		Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
2535	21100	1RB_Low	Rear	Fig.10	23.91	24.0	0.328	**0.33**	0.631	**0.64**	-0.12

Note1: The distance between the EUT and the phantom bottom is 15mm.
Note2: The LTE mode is QPSK_20MHz.

Table 14.29: SAR Values (LTE Band7 -Body) with Battery for SCUD – AP ON

Ambient Temperature: 22.5 °C					Liquid Temperature: 22.0 °C						
Frequency		Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
2560	21350	1RB_Low	Rear	Fig.11	18.28	19.0	0.154	**0.18**	0.334	**0.39**	0.14

Note1: The distance between the EUT and the phantom bottom is 10mm.

Note2: The LTE mode is QPSK_20MHz.

Table 14.30: SAR Values (Wi-Fi 802.11b - Head) with Battery for SCUD

Ambient Temperature: 22.5 °C						Liquid Temperature: 22.0 °C					
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.										
2412	1	Left	Touch	Fig.12	18.97	19.0	0.035	**0.04**	0.083	**0.09**	0.04

Note: The WiFi mode is 802.11b-11Mbps.

Table 14.31: SAR Values (Wi-Fi 802.11b - Body) with Battery for SCUD

Ambient Temperature: 22.5 °C					Liquid Temperature: 22.0 °C					
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g)(W/kg)	Power Drift (dB)
MHz	Ch.									
2412	1	Right	Fig.13	18.97	19.0	0.010	**0.01**	0.025	**0.03**	0.06

Note1: The distance between the EUT and the phantom bottom is 10mm.

Note2: The WiFi mode is 802.11b-11Mbps.

15 SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeated measurements are required.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps2) through 4) do not apply.

2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.

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

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

16 Measurement Uncertainty

16.1 Measurement Uncertainty for Normal SAR Tests (300MHz~3GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	5.5	N	1	1	1	5.5	5.5	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RFambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
12	Probe positioning with respect to phantom shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Test sample related										
14	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
15	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
16	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
17	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
18	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
19	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
20	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
21	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521