TEST REPORT

No.I18N00288-SAR

For

Meizu Technology Co., Ltd.

LTE Mobile Phone

Model Name: M809L

With

Hardware Version: V1.0

Software Version: Meizu 8.1.1.0G

FCC ID: 2ANQ6-M809L

Issued Date: 2018-04-24

Designation Number: CN1210

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 SAICT.

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REPORT HISTORY

Report Number	Revision	Issue Date	Description
I18N00288-SAR	Rev.0	2018-04-24	Initial creation of test report

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1 Test Laboratory

1.1 Testing Location

Company Name:	Shenzhen Academy of Information and Communications Technology
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Postal Code:	518026
Telephone:	+86-755-33322000
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1.2 Testing Environment

Temperature:	18°C~25 °C
Relative humidity:	30%~ 70%
Ground system resistance:	<4Ω
Ambient noise & Reflection:	< 0.012 W/kg

1.3 Project Data

Testing Start Date:	February 26, 2018
Testing End Date:	April 09, 2018

1.4 Signature

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(Approved this test report)

2 Statement of Compliance

This EUT is a variant product and the report of original sample is No.I18N00176-SAR. According to the client request, we quote the test results of original sample. The results of spot check are presented in annex K.

The maximum results of Specific Absorption Rate (SAR) found during testing for Meizu Technology Co., Ltd. LTE Mobile Phone M809L are as follows:

Table 2.1: Highest Reported SAR (1g)

Exposure Configuration	Technology Band	Highest Reported SAR 1g(W/Kg)	Equipment Class
Head (Separation Distance 0mm)	GSM850	0.26	PCE
	PCS1900	0.18	
	CDMA BC0	0.52	
	UMTS FDD 5	0.46	
	UMTS FDD 2	0.34	
	UMTS FDD 4	0.08	
	LTE Band 2	0.26	
	LTE Band 4	0.08	
	LTE Band 5	0.43	
	LTE Band 7	0.17	
	WLAN 2.4GHz	0.46	DTS
Body (Separation Distance 10mm)	GSM850	0.53	PCE
	PCS1900	0.63	
	CDMA BC0	0.64	
	UMTS FDD 5	0.64	
	UMTS FDD 2	0.58	
	UMTS FDD 4	1.32	
	LTE Band 2	0.64	
	LTE Band 4	**1.36**	
	LTE Band 5	0.52	
	LTE Band 7	0.78	
	WLAN 2.4GHz	0.14	DTS

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 C95.1-1992.

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 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**: 1.36W/kg (1g).**

Table 2.2: The sum of reported SAR values for main antenna and Wi-Fi

	Position	Main antenna	Wi-Fi	Sum
Highest reported SAR value for Head	Left Touch	0.52	0.46	**0.98**
Highest reported SAR value for Body	Rear	1.36	0.14	**1.50**

Table2.3: The sum of reported SAR values for main antenna and BT

	Position	Main antenna	BT*	Sum
Highest reported SAR value for Head	Left Touch	0.52	0.37	**0.89**
Highest reported SAR value for Body	Rear	1.36	0.21	**1.57**

BT*-Estimated SAR for Bluetooth (seethetable13.3)

According to the above tables, the highest sum of reported SAR values is **1.57W/kg (1g)**. The detail for simultaneous transmission consideration is described in chapter 13.

3 Client Information

3.1 Applicant Information

Company Name:	Meizu Technology Co., Ltd.
Address /Post:	Meizu Tech Bldg., Technology & Innovation Coast, Zhuhai, Guangdong Province, China
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3.2 Manufacturer Information

Company Name:	Meizu Technology Co., Ltd.
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Telephone:	+86-0756-6116256
Fax:	/

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

4.1 About EUT

Description:	LTE Mobile Phone
Model Name:	M809L
Operating mode(s):	GSM 850/1900, WCDMA 850/1700/1900, CDMA BC0, LTE_FDD Band 2/4/5/7, BT, Wi-Fi 2.4G
Tested Tx Frequency:	825 – 848.8MHz (GSM 850)
	1850.2 – 1910MHz (GSM 1900)
	824.7 – 848.3MHz (CDMA BC0)
	826.4 – 846.6MHz (WCDMA850 Band V)
	1712.4 – 1752.6MHz (WCDMA1700 Band IV)
	1852.4 – 1907.6MHz (WCDMA1900 Band II)
	1850.7 – 1909.3MHz (LTE_FDD Band 2)
	1710.7 – 1754.3MHz (LTE_FDD Band 4)
	824.7 – 848.3MHz (LTE_FDD Band 5)
	2502.5 – 2567.5MHz (LTE_FDD Band 7)
	2412 – 2462MHz (Wi-Fi 2.4G)
GPRS&EGPRS Multislot Class:	12
Test device Production information:	Production unit
Device type:	Portable device
Antenna type:	Integrated antenna
Hotspot mode:	Support

4.2 Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	IMEI: 867865030006181	V1.0	Flyme 6.3.5.0G
EUT2	IMEI: 867865030007023	V1.0	Flyme 6.3.5.0G
EUT3	IMEI: 867865030008344	V1.0	Flyme 6.3.5.0G
EUT4	IMEI: 867865030006702	V1.0	Flyme 6.3.5.0G
EUT5	IMEI: 867865030008765	V1.0	Flyme 6.3.5.0G
EUT6	IMEI: 867865030006165	V1.0	Flyme 6.3.5.0G
EUT7	IMEI: 867865030008443	V1.0	Flyme 6.3.5.0G
EUT8	IMEI: 867877030004868	V1.0	Meizu 8.1.1.0G
EUT9	IMEI: 867877030004801	V1.0	Meizu 8.1.1.0G
EUT10	IMEI: 867873030006326	V1.0	Meizu 8.1.1.0G

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

Note: It is performed to test SAR with the EUT 1 & 2 & 3 & 4 & 8 & 9 & 10, and conducted power with the EUT 5 & 6 & 7.

4.3 Internal Identification of AE used during the test

AE ID*	Description	Model	Manufacturer
AE1	Battery	BA810	DONG GUAN DER NEW ENERGY CO.,LTD.
AE2	Battery	BA810	Ningbo Veken Battery Co., Ltd.
AE3	Battery	BA810	Sunwoda Electronic CO.,LTD.
AE4	Headset	EP21HD	Foster Electric Co.（HONG KONG）Ltd

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

5 TEST METHODOLOGY

5.1 Applicable Limit Regulations

ANSI C95.1–1992: 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 1528–2013: Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Experimental Techniques.

KDB 447498 D01 General RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

KDB648474 D04 Handset SAR v01r03: SAR Evaluation Considerations for Wireless Handsets.

KDB941225 D01 SAR test for 3G devices v03r01: SAR Measurement Procedures for 3G Devices

KDB941225 D05 SAR for LTE Devices v02r05: SAR Evaluation Considerations for LTE Devices

KDB 941225 D06 Hot Spot SAR v02r01: SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities

KDB 248227 D01 802.11 Wi-Fi SAR v02r02: SAR Guidance for IEEE 802.11 (Wi-Fi) Transmitters.

KDB 865664 D01SAR measurement 100 MHz to 6 GHz v01r04: SAR Measurement Requirements for 100 MHz to 6 GHz.

KDB 865664 D02 RF Exposure Reporting v01r02: 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

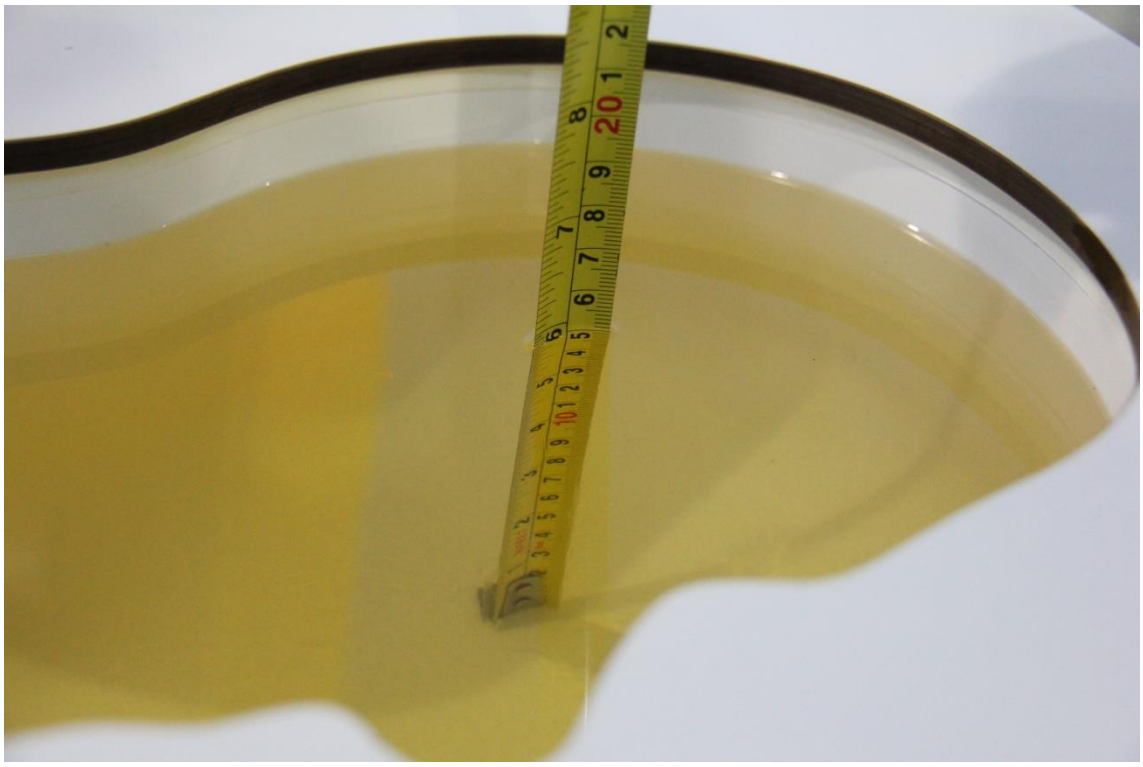
Frequency (MHz)	Liquid Type	Conductivity (σ)	± 5% Range	Permittivity (ε)	± 5% Range
835	Head	0.90	0.86～0.95	41.5	39.4～43.6
835	Body	0.97	0.92～1.02	55.2	52.4～58.0
1800	Head	1.40	1.33～1.47	40.0	38.0～42.0
1800	Body	1.52	1.44～1.60	53.5	50.8～56.1
1900	Head	1.40	1.33～1.47	40.0	38.0～42.0
1900	Body	1.52	1.44～1.60	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
2550	Head	1.91	1.81～2.01	39.07	37.1～41.0
2550	Body	2.09	1.99～2.19	52.6	50.0～55.2

7.2 Dielectric Performance

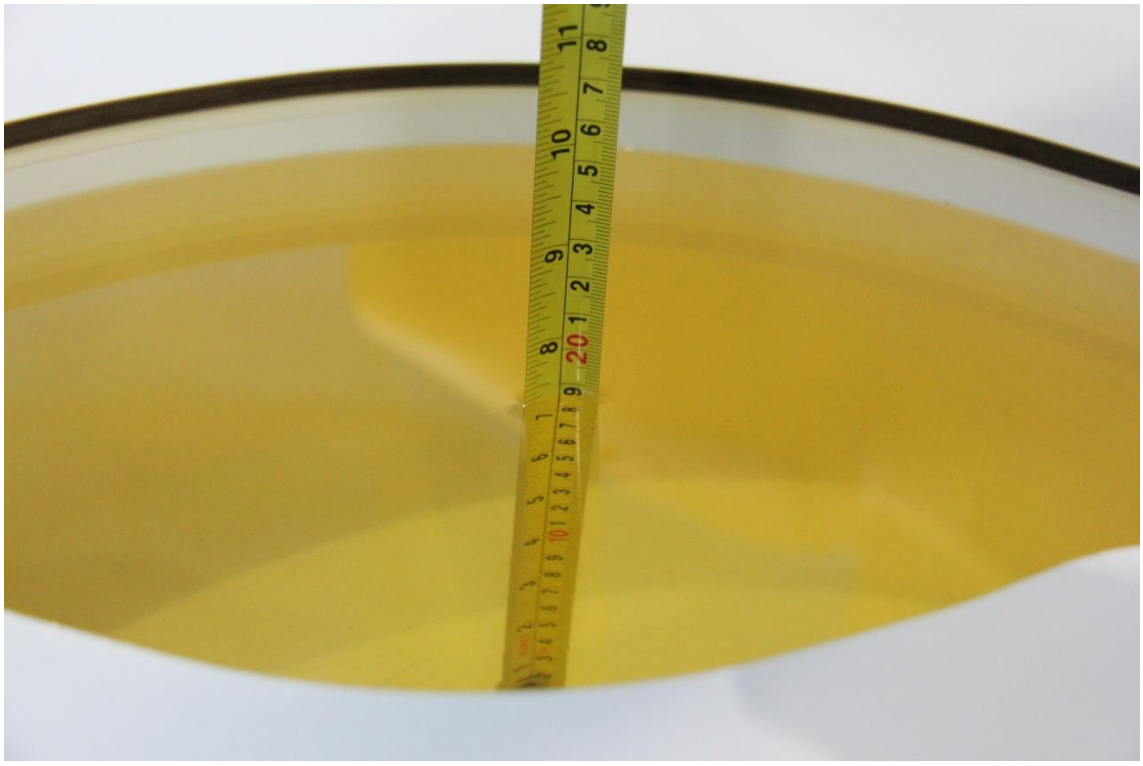
Table 7.2: Dielectric Performance of Tissue Simulating Liquid

Measurement Date (yyyy-mm-dd)	Type	Frequency	Conductivity σ (S/m)	Drift (%)	Permittivity ε	Drift (%)
2018-3-10	Head	835	0.912	1.33	40.75	-1.81
2018-3-12	Body	835	0.988	1.86	53.64	-2.83
2018-3-2	Head	1800	1.409	0.64	39.65	-0.88
2018-3-2	Body	1800	1.503	-1.12	51.82	-3.14
2018-3-5	Head	1900	1.416	1.14	39.29	-1.78
2018-3-5	Body	1900	1.554	2.24	51.75	-2.91
2018-3-14	Head	2450	1.847	2.61	38.06	-2.91
2018-3-14	Body	2450	1.976	1.33	52.19	-0.97
2018-2-26	Head	2550	1.977	3.51	38.37	-1.79
2018-2-26	Body	2550	2.105	0.72	51.93	-1.27
2018-4-4	Head	835	0.917	1.89	40.54	-2.31
2018-4-4	Body	835	0.963	-0.72	54.06	-2.07
2018-4-3	Head	1800	1.414	1.00	39.52	-1.20
2018-4-3	Body	1800	1.515	-0.33	52.37	-2.11
2018-4-3	Head	1900	1.422	1.57	39.06	-2.35
2018-4-3	Body	1900	1.549	1.91	51.84	-2.74
2018-4-8	Head	2450	1.842	2.33	38.39	-2.07
2018-4-8	Body	2450	1.985	1.79	52.38	-0.61
2018-4-9	Head	2550	1.965	2.88	38.15	-2.35
2018-4-9	Body	2550	2.113	1.10	52.07	-1.01

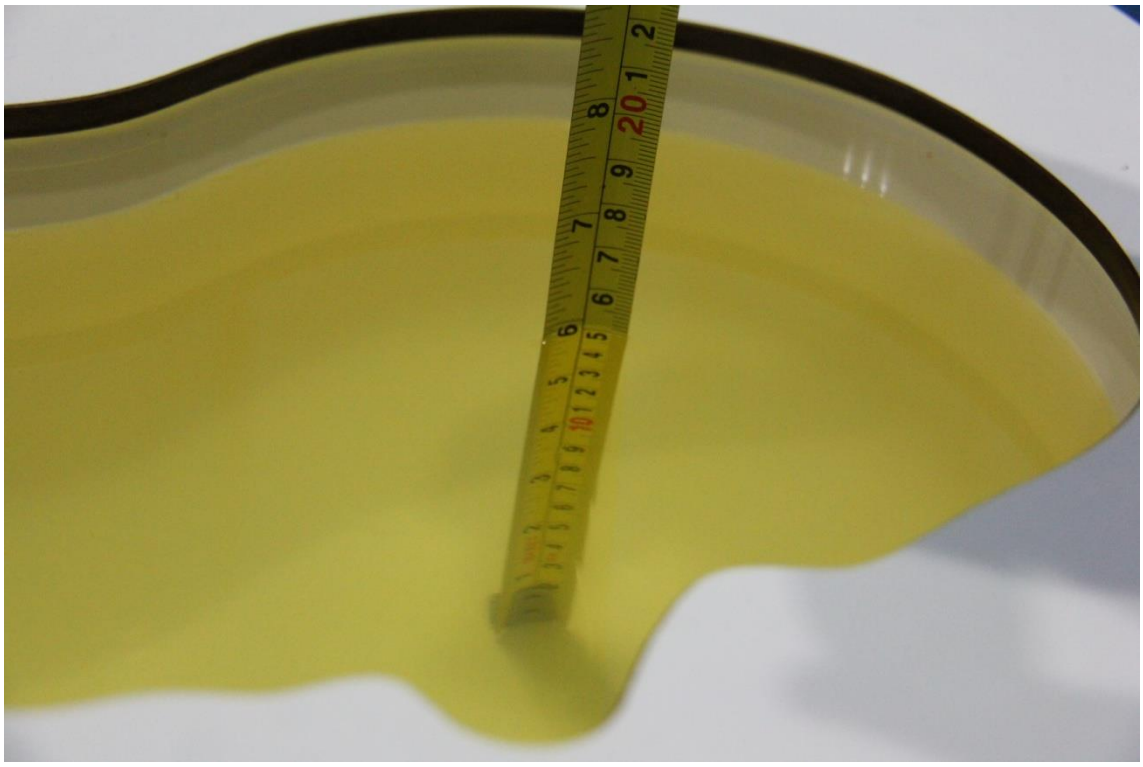
Note: The liquid temperature is 22.0^{o}C



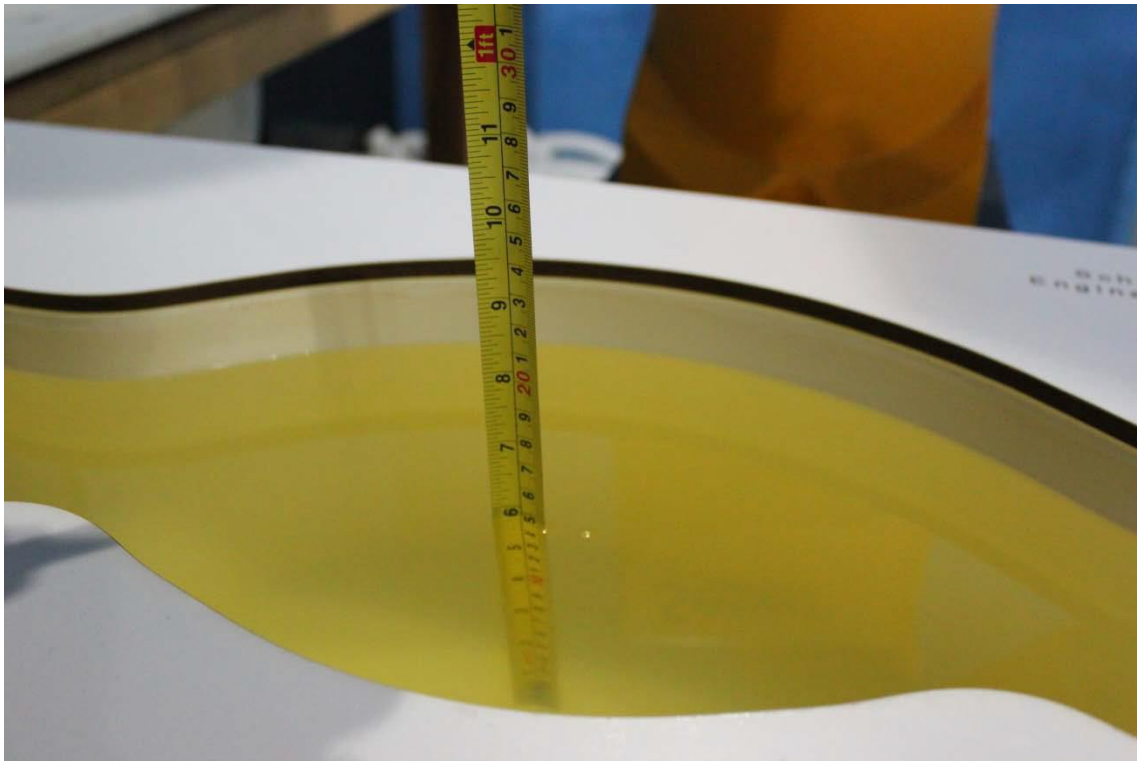
Picture 7-1: Liquid depth in the Head Phantom (835 MHz)



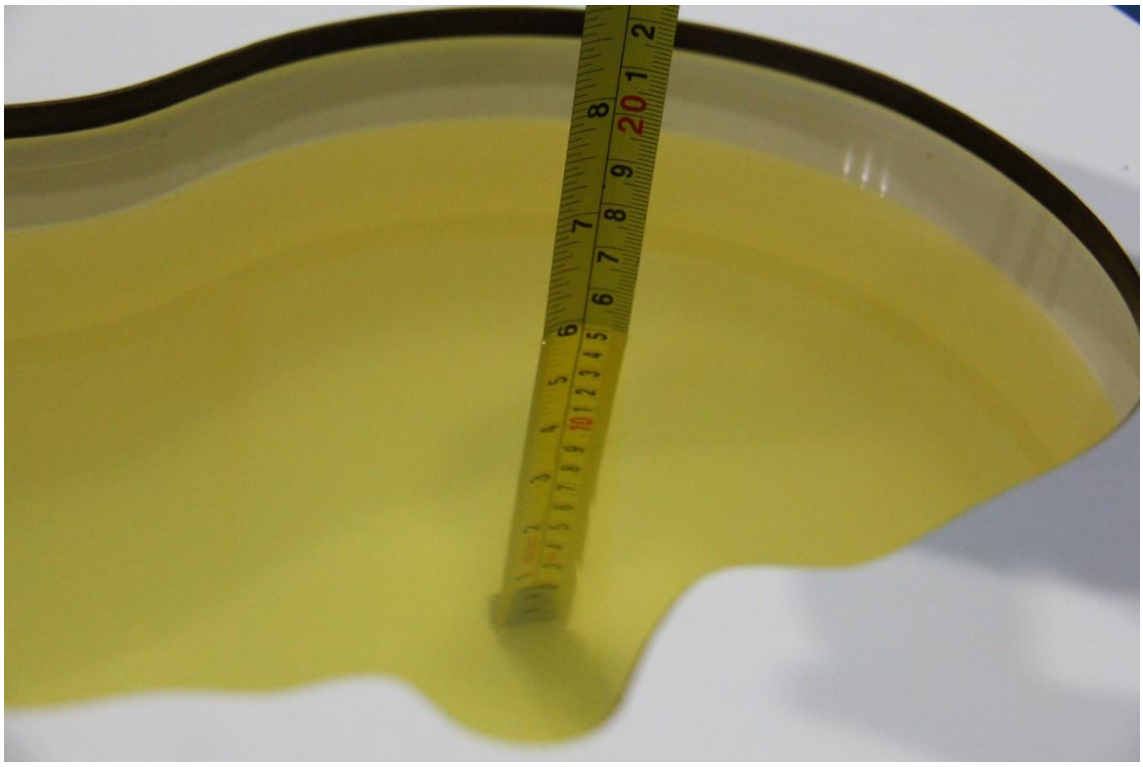
Picture 7-2: Liquid depth in the Flat Phantom (835 MHz)



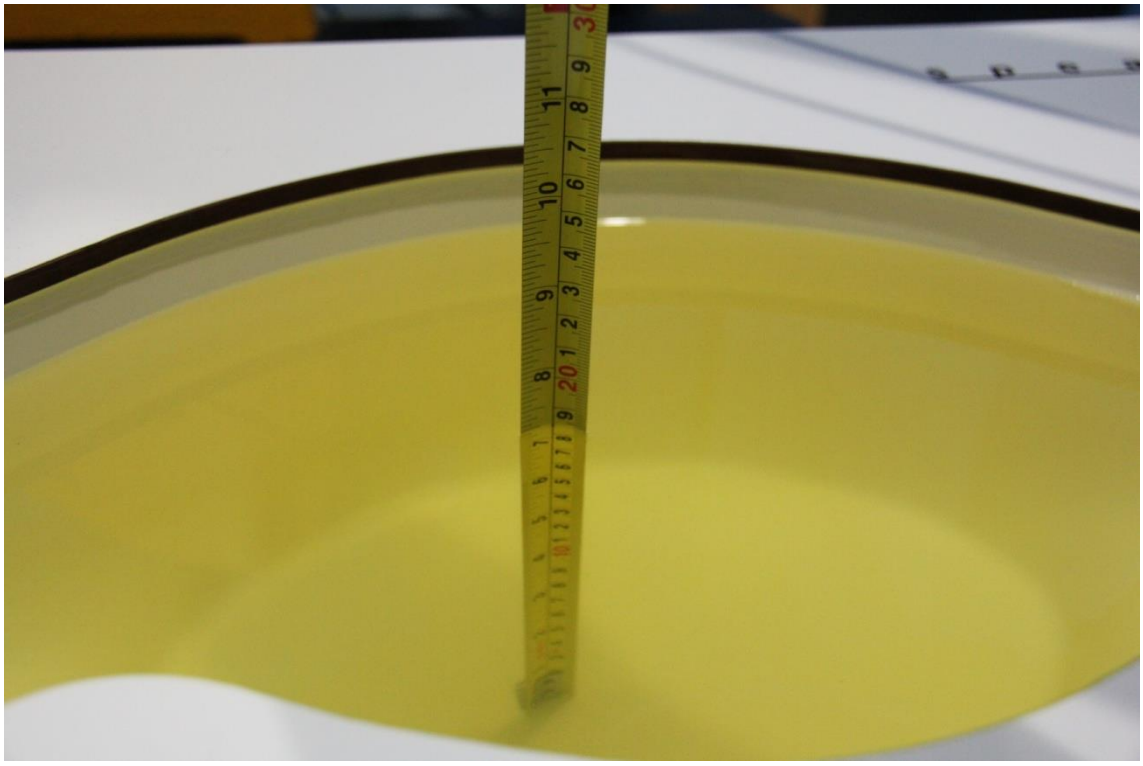
Picture 7-3: Liquid depth in the Head Phantom (1800 MHz)



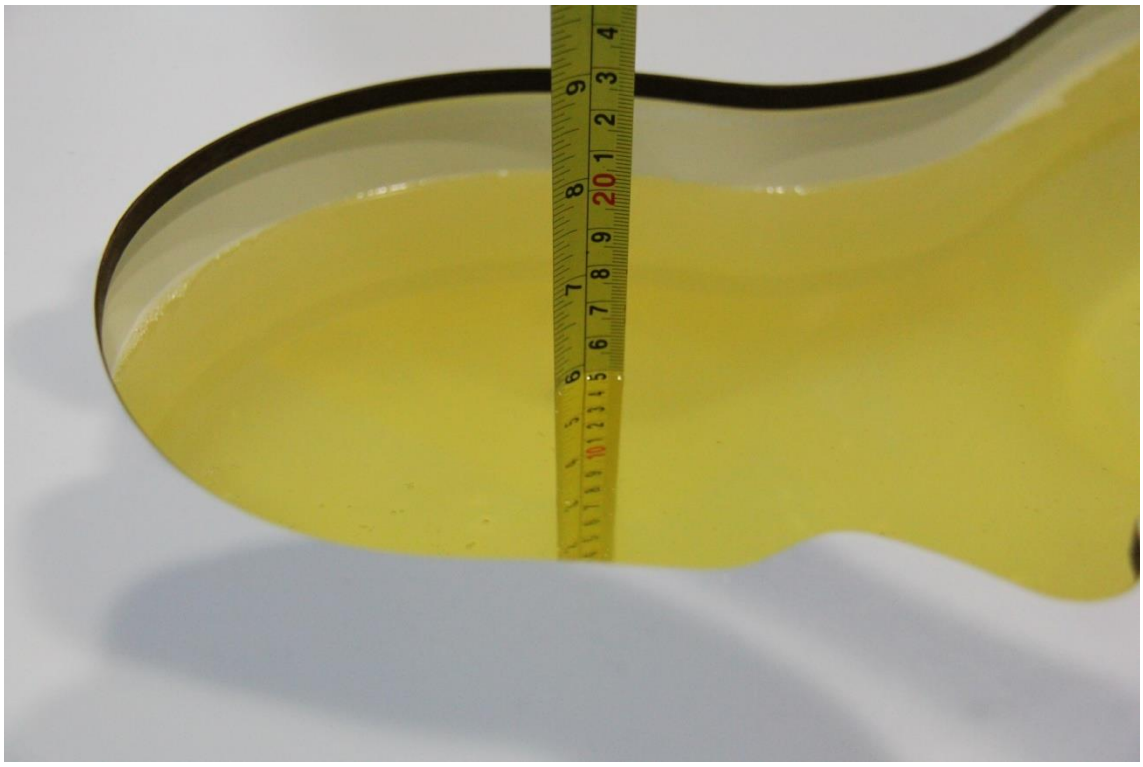
Picture 7-4: Liquid depth in the Flat Phantom (1800MHz)



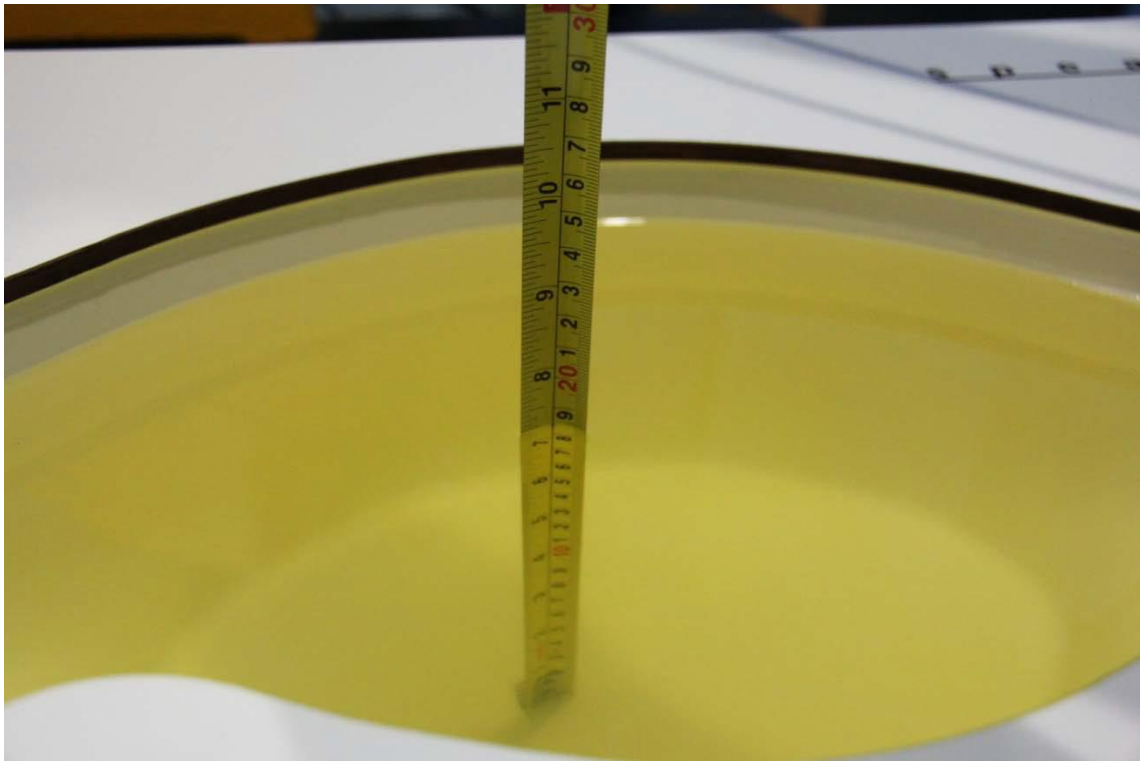
Picture 7-5: Liquid depth in the Head Phantom (1900 MHz)



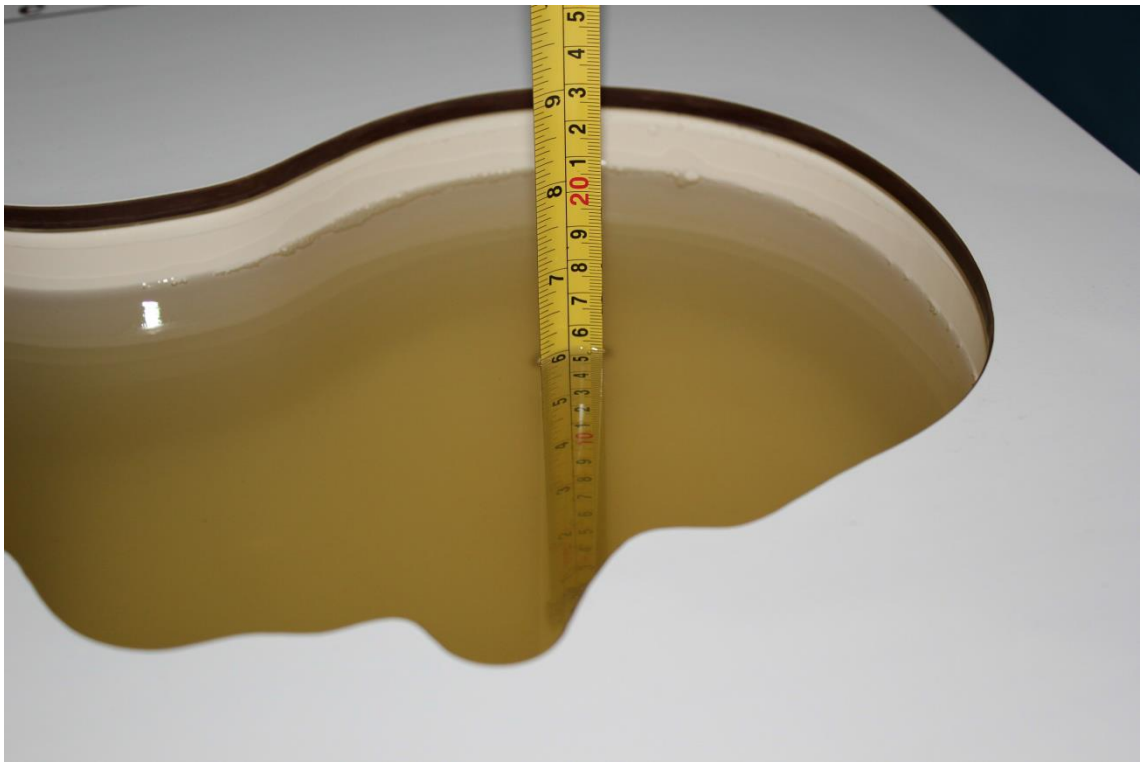
Picture 7-6: Liquid depth in the Flat Phantom (1900MHz)



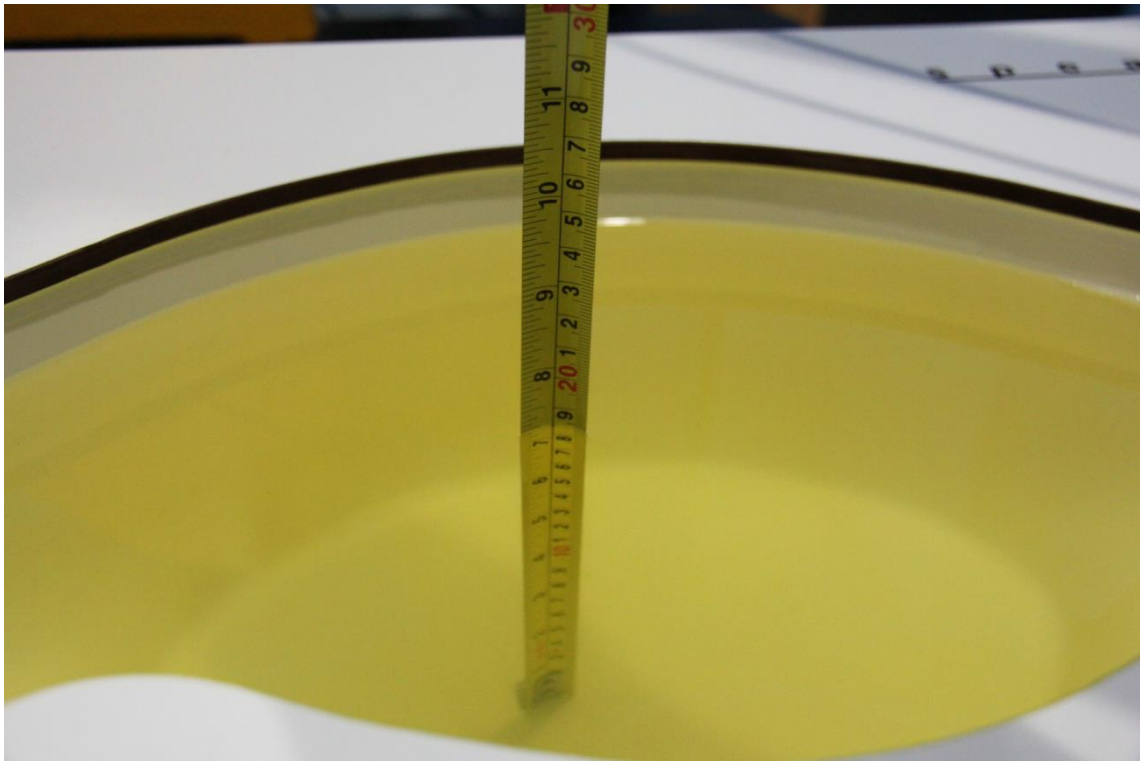
Picture 7-7: Liquid depth in the Head Phantom(2450MHz)



Picture 7-8: Liquid depth in the Flat Phantom(2450MHz)



Picture 7-9: Liquid depth in the Head Phantom(2550MHz)

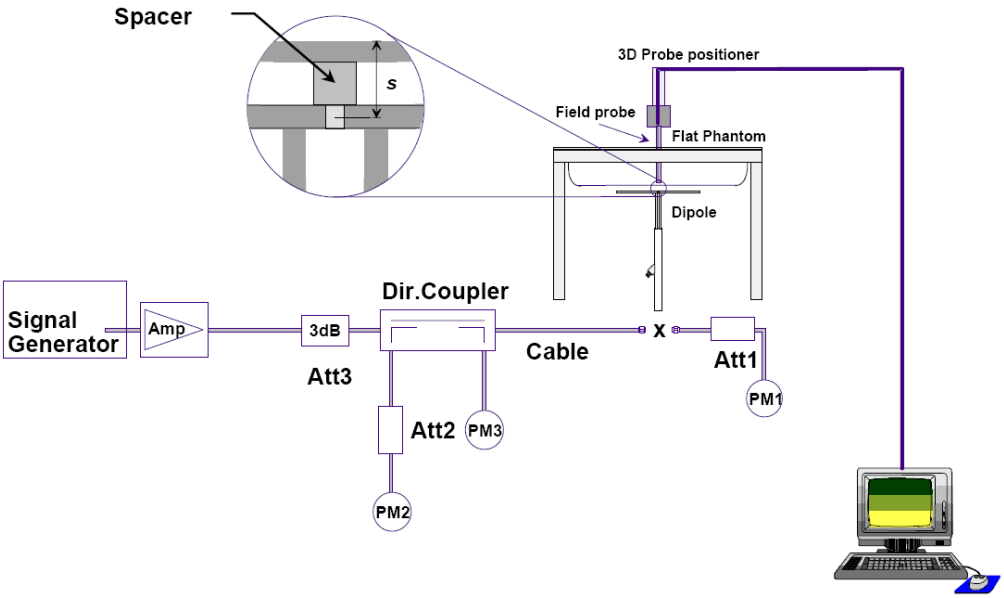


Picture 7-10: Liquid depth in the Flat Phantom(2550MHz)

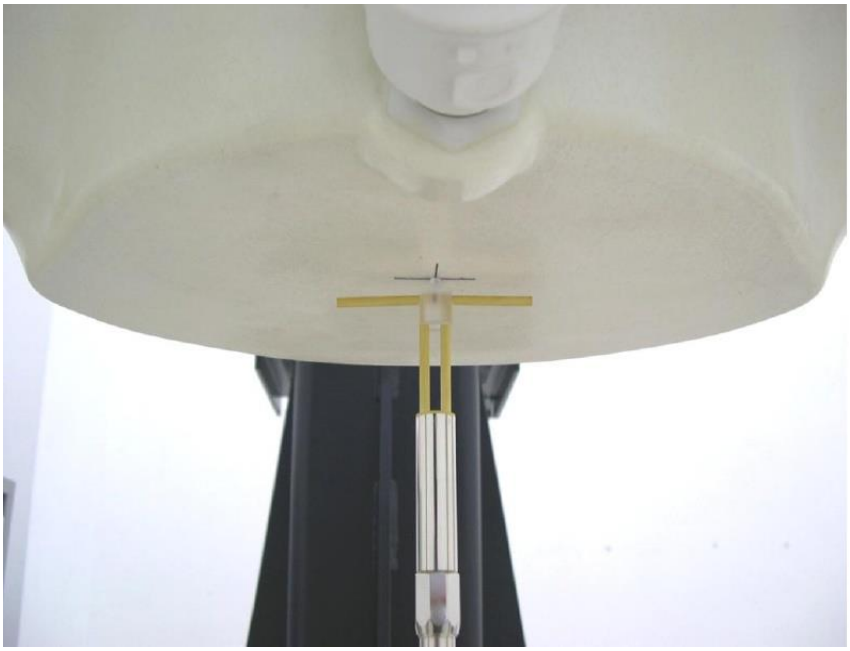
8 System verification

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
2018-3-10	835 MHz	6.03	9.22	6.12	9.48	1.49	2.82
2018-3-2	1800 MHz	20.6	38.8	20.88	39.56	1.36	1.96
2018-3-5	1900 MHz	21.0	40.8	21.24	41.60	1.14	1.96
2018-3-14	2450 MHz	24.1	52.5	23.92	51.60	-0.75	-1.71
2018-2-26	2550 MHz	26.2	57.2	26.72	59.20	1.98	3.50
2018-4-4	835 MHz	6.03	9.22	6.20	9.52	2.82	3.25
2018-4-3	1800 MHz	20.6	38.8	21.00	39.84	1.94	2.68
2018-4-3	1900 MHz	21.0	40.8	21.36	42.40	1.71	3.92
2018-4-8	2450 MHz	24.1	52.5	23.68	50.40	-1.74	-4.00
2018-4-9	2550 MHz	26.2	57.2	26.32	58.00	0.46	1.40

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
2018-3-12	835 MHz	6.20	9.44	6.32	9.80	1.94	3.81
2018-3-2	1800 MHz	21.1	39.6	20.76	38.68	-1.61	-2.32
2018-3-5	1900 MHz	21.3	41.1	21.84	42.40	2.54	3.16
2018-3-14	2450 MHz	24.4	52.3	24.72	54.00	1.31	3.25
2018-2-26	2550 MHz	25.1	54.8	24.64	53.20	-1.83	-2.92
2018-4-4	835 MHz	6.20	9.44	6.08	9.16	-1.94	-2.97
2018-4-3	1800 MHz	21.1	39.6	20.60	38.24	-2.37	-3.43
2018-4-3	1900 MHz	21.3	41.1	21.60	42.00	1.41	2.19
2018-4-8	2450 MHz	24.4	52.3	24.92	54.40	2.13	4.02
2018-4-9	2550 MHz	25.1	54.8	24.88	54.00	-0.88	-1.46

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.

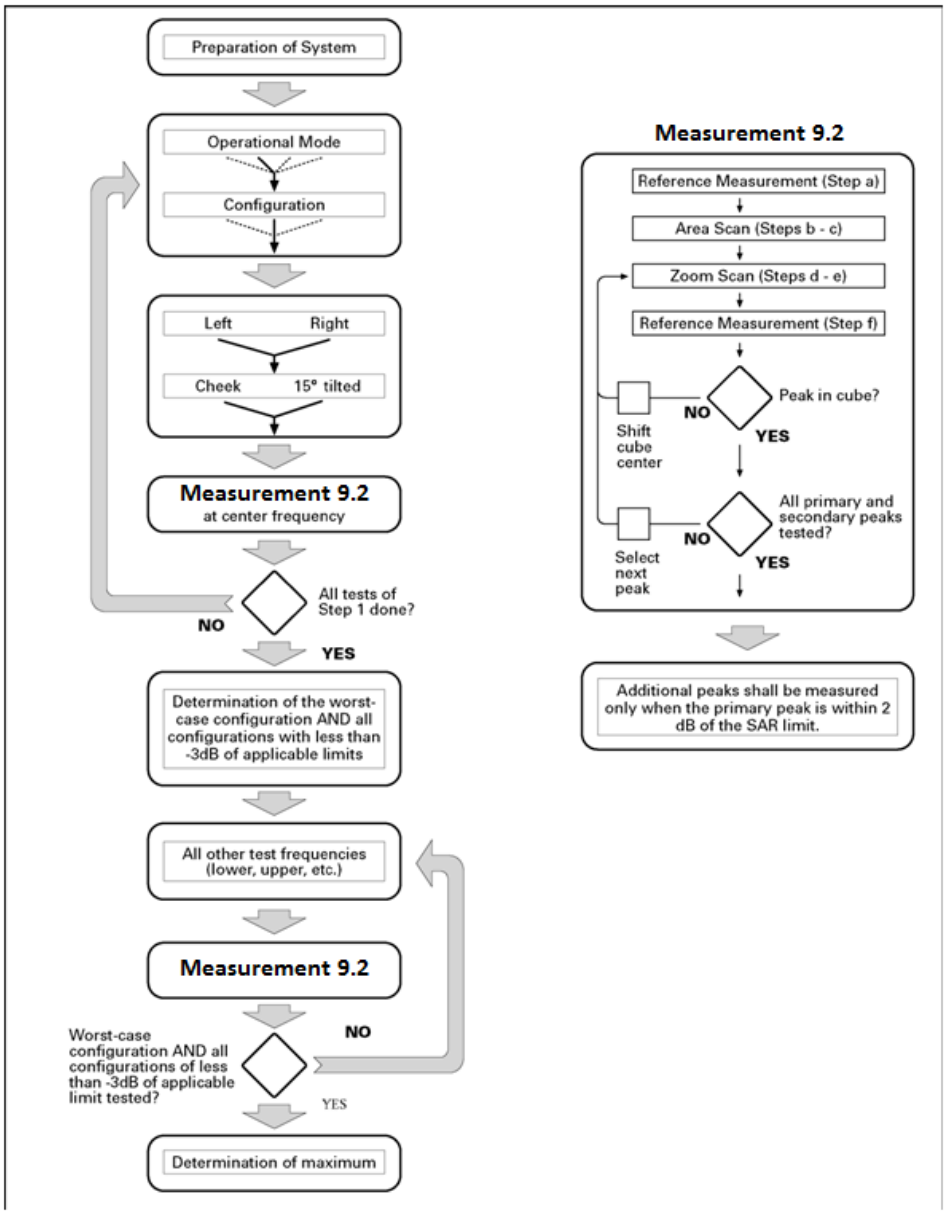
Step 1: The tests described in 9.2 shall be performed at the channel that is closest to the center of the transmit frequency band (f_c) for:

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 within 3 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 1528-2013. 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.

			≤ 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: Δx_{Area}, Δy_{Area}			≤ 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.	
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

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.

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	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	12/15	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	4/15	56/75	4	1	3.0	2.0	17	71
5	15/15	15/15	64	15/15	24/15	30/15	134/15	4	1	1.0	0.0	21	81

9.4 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.

9.5 SAR Measurement for LTE

SAR tests for LTE are performed with a base station simulator, Anristu MT8820C. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. All powers were measured with the Anristu MT8820C.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.

9.6 Power Drift

To control the output power stability during the SAR test, DASY5 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 Section 14 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, 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 55 wireless handsets. For the sample size studied, the root-mean-squared errors of the algorithm are 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 of this study can be found in the BEMS 2007 Proceedings.

Both algorithms are implemented in DASY software.

11 Conducted Output Power

11.1 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 11.1: The conducted power measurement results for GSM850/1900

		Conducted Power (dBm)		
GSM850MHz	**Tune up**	Channel 251 (848.8MHz)	Channel 190 (836.6MHz)	Channel 128 (824.2MHz)
	34	32.81	32.67	32.60
		Conducted Power(dBm)		
GSM1900MHz	**Tune up**	Channel 810 (1909.8MHz)	Channel 661 (1880MHz)	Channel 512 (1850.2MHz)
	31	30.25	30.06	29.78

Table 11.2: The conducted power measurement results for GPRS and EGPRS

GPRS 850	**Tune up**	Measured Power (dBm)			calculation	Average Power (dBm)		
		251	190	128		251	190	128
1Tx-slots	**34**	32.68	32.57	32.51	-9.03dB	23.65	23.54	23.48
2Tx-slots	**32**	31.13	30.93	30.97	-6.02dB	25.11	24.91	24.95
3Tx-slots	**30**	**29.88**	**29.92**	**29.63**	-4.26dB	25.62	**25.66**	25.37
4Tx-slots	**29**	28.01	28.07	27.90	-3.01dB	25.00	25.06	24.89
EGPRS 850 (8PSK)	**Tune up**	Measured Power (dBm)			calculation	Measured Power (dBm)		
		251	190	128		251	190	128
1Tx-slots	**26**	24.45	24.49	24.58	-9.03dB	15.42	15.46	15.55
2Tx-slots	**25**	24.11	24.10	24.26	-6.02dB	18.09	18.08	18.24
3Tx-slots	**23**	22.17	22.14	22.22	-4.26dB	17.91	17.88	17.96
4Tx-slots	**22**	20.70	20.75	20.92	-3.01dB	17.69	17.74	17.91

GPRS 1900	Tune up	Measured Power (dBm)			calculation	Average Power (dBm)		
		810	661	512		810	661	512
1Tx-slots	31	30.15	29.70	29.70	-9.03dB	21.12	20.668	20.67
2Tx-slots	29	28.19	27.98	27.78	-6.02dB	22.17	21.96	21.76
3Tx-slots	28	**27.19**	**26.94**	**26.70**	-4.26dB	**22.93**	22.68	22.44
4Tx-slots	26	24.64	24.48	24.26	-3.01dB	21.63	21.47	21.25
EGPRS 1900 (8PSK)	Tune up	Measured Power (dBm)			calculation	Measured Power (dBm)		
		810	661	512		810	661	512
1Tx-slots	24	22.79	22.73	22.68	-9.03dB	13.76	13.7	13.65
2Tx-slots	23	22.09	22.03	22.01	-6.02dB	16.07	16.01	15.99
3Tx-slots	22	20.82	20.79	20.74	-4.26dB	16.56	16.53	16.48
4Tx-slots	20	19.52	19.45	19.43	-3.01dB	16.51	16.44	16.42

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 3Tx-slots for GSM 850 and GSM1900.

11.2 CDMA Measurement result

Table 11.3: The conducted power for CDMA

CDMA BC0	Tune up	Conducted Power (dBm)		
		Channel 777 (848.31MHz)	Channel 384 (836.52MHz)	Channel 1013 (824.7MHz)
SO55/RC3	24	23.46	**23.39**	23.59
SO55/RC1	24	23.40	23.37	23.52
SO32/RC3(FCH only)	24	23.44	**23.41**	23.55
SO32/RC3(FCH+SCH_n)	24	23.38	23.35	23.47
EVDO Rev.0	24	23.33	23.36	23.42
EVDO Rev.A	24	23.31	23.35	23.36

11.3 WCDMA Measurement result

Table 11.4: The conducted Power for WCDMA850/1700/1900

Item	band	FDD Band 5 result			
	ARFCN	Tune up	4233 (846.6MHz)	4182 (836.4MHz)	4132 (826.4MHz)
WCDMA	\	23	21.7	22.1	22.1
HSDPA	1	22	20.6	21.0	21.0
	2	22	20.7	21.0	21.0
	3	22	20.2	20.6	20.6
	4	22	20.1	20.6	20.7
HSUPA	1	22	20.7	21.0	21.0
	2	21	19.7	20.1	20.1
	3	21	19.7	19.6	20.2
	4	22	20.2	20.5	20.5
	5	22	20.8	21.1	21.1
Item	band	FDD Band 4 result			
	ARFCN	Tune up	1513 (1752.6MHz)	1413 (1732.6MHz)	1312 (1712.4MHz)
WCDMA	\	23	22.1	22.2	22.4
HSDPA	1	22	21.2	21.2	21.5
	2	22	21.1	21.1	21.5
	3	22	20.7	20.7	21.0
	4	22	20.7	20.7	21.0
HSUPA	1	22	21.2	21.4	21.7
	2	21	20.3	20.3	20.6
	3	21	20.3	20.3	20.5
	4	21.5	20.8	20.7	21.0
	5	22	21.1	21.3	21.5
Item	band	FDD Band 2 result			
	ARFCN	Tune up	9538 (1907.6MHz)	9400 (1880MHz)	9262 (1852.4MHz)
WCDMA	\	23	22.6	22.5	22.1
HSDPA	1	22	21.6	21.6	21.2
	2	22	21.6	21.6	21.0
	3	22	21.0	21.1	21.6
	4	22	21.1	21.0	20.5
HSUPA	1	22	20.9	21.6	21.1
	2	21	20.6	20.6	20.0
	3	21	20.2	20.4	19.6
	4	21.5	21.1	21.2	20.6
	5	22	21.6	21.6	21.1

11.4 LTE-FDD Measurement result

Table 11.5: The conducted Power for LTE

LTE-FDD Band 2				Actual output Power (dBm)			Tune up
Band-width	RB allocation	RB offset	Modulation	High	Middle	Low	
1.4 MHz				1909.3MHz	1880MHz	1850.7MHz	
	1RB	High	QPSK	22.54	22.29	22.27	23.5
			16QAM	21.29	21.39	20.80	22.5
		Middle	QPSK	22.64	22.38	22.33	23.5
			16QAM	21.37	21.15	21.16	22.5
		Low	QPSK	22.35	22.28	22.24	23.5
			16QAM	21.24	20.86	20.84	22.5
	3RB	High	QPSK	22.71	22.46	22.37	23.5
			16QAM	21.34	21.20	21.14	22.5
		Middle	QPSK	22.70	22.43	22.57	23.5
			16QAM	21.89	21.50	21.28	22.5
		Low	QPSK	22.68	22.43	22.44	23.5
			16QAM	21.93	21.62	21.25	22.5
	6RB	/	QPSK	21.63	21.38	21.38	22.5
			16QAM	20.31	20.25	20.04	21.5
3 MHz				1908.5MHz	1880MHz	1851.5MHz	/
	1RB	High	QPSK	22.48	22.39	22.29	23.5
			16QAM	21.09	20.96	21.08	22.5
		Middle	QPSK	22.69	22.38	22.32	23.5
			16QAM	21.37	20.99	21.04	22.5
		Low	QPSK	22.59	22.25	22.33	23.5
			16QAM	21.12	20.77	21.04	22.5
	8RB	High	QPSK	21.66	21.43	21.41	22.5
			16QAM	20.50	20.45	20.41	21.5
		Middle	QPSK	21.72	21.38	21.35	22.5
			16QAM	20.61	20.38	20.35	21.5
		Low	QPSK	21.61	21.38	21.32	22.5
			16QAM	20.88	20.37	20.40	21.5
	15RB	/	QPSK	21.63	21.37	21.33	22.5
			16QAM	20.75	20.32	20.16	21.5

LTE-FDD Band 2				Actual output Power (dBm)			Tune up
Band-width	RB allocation	RB offset	Modulation	High	Middle	Low	
5 MHz				1907.5MHz	1880MHz	1852.5MHz	
	1RB	High	QPSK	22.35	22.45	22.12	**23.5**
			16QAM	21.27	20.91	20.82	**22.5**
		Middle	QPSK	22.78	22.35	22.19	**23.5**
			16QAM	21.43	20.99	21.06	**22.5**
		Low	QPSK	22.45	22.37	22.19	**23.5**
			16QAM	21.04	21.06	21.00	**22.5**
	12RB	High	QPSK	21.60	21.48	21.29	**22.5**
			16QAM	20.52	20.45	20.00	**21.5**
		Middle	QPSK	21.74	21.42	21.27	**22.5**
			16QAM	20.59	20.28	20.12	**21.5**
		Low	QPSK	21.67	21.44	21.32	**22.5**
			16QAM	20.66	20.37	20.09	**21.5**
	25RB	/	QPSK	21.60	21.43	21.32	**22.5**
			16QAM	20.80	20.40	20.29	**21.5**
10 MHz				1905MHz	1880MHz	1855MHz	/
	1RB	High	QPSK	22.55	22.31	22.06	**23.5**
			16QAM	21.35	21.18	21.04	**22.5**
		Middle	QPSK	22.59	22.49	22.23	**23.5**
			16QAM	21.38	21.09	21.12	**22.5**
		Low	QPSK	22.62	22.29	22.08	**23.5**
			16QAM	21.18	21.22	21.05	**22.5**
	25RB	High	QPSK	21.60	21.38	21.38	**22.5**
			16QAM	20.59	20.28	20.30	**21.5**
		Middle	QPSK	21.60	21.43	21.41	**22.5**
			16QAM	20.63	20.31	20.34	**21.5**
		Low	QPSK	21.65	21.45	21.32	**22.5**
			16QAM	20.67	20.35	20.28	**21.5**
	50RB	/	QPSK	21.49	21.41	21.39	**22.5**
			16QAM	20.57	20.41	20.33	**21.5**

LTE-FDD Band 2				Actual output Power (dBm)			Tune up
Band-width	RB allocation	RB offset	Modulation	High	Middle	Low	
15 MHz				1902.5MHz	1880MHz	1857.5MHz	
	1RB	High	QPSK	22.43	22.36	22.49	**23.5**
			16QAM	21.27	21.09	20.98	**22.5**
		Middle	QPSK	22.43	22.30	22.30	**23.5**
			16QAM	21.53	21.55	20.85	**22.5**
		Low	QPSK	22.33	22.26	22.26	**23.5**
			16QAM	21.33	21.21	21.08	**22.5**
	25RB	High	QPSK	21.65	21.39	21.34	**22.5**
			16QAM	20.59	20.26	20.25	**21.5**
		Middle	QPSK	21.57	21.46	21.35	**22.5**
			16QAM	20.67	20.32	20.23	**21.5**
		Low	QPSK	21.60	21.44	21.34	**22.5**
			16QAM	20.58	20.21	20.25	**21.5**
	50RB	/	QPSK	21.54	21.41	21.38	**22.5**
			16QAM	20.62	20.39	20.39	**21.5**
20 MHz				1900MHz	1880MHz	1860MHz	/
	1RB	High	QPSK	22.54	22.39	22.39	**23.5**
			16QAM	21.12	21.08	20.73	**22.5**
		Middle	QPSK	22.78	22.37	22.47	**23.5**
			16QAM	21.90	21.38	21.10	**22.5**
		Low	QPSK	22.57	**22.48**	22.21	**23.5**
			16QAM	21.35	20.77	20.76	**22.5**
	50RB	High	QPSK	21.54	21.50	21.44	**22.5**
			16QAM	20.39	20.45	20.49	**21.5**
		Middle	QPSK	21.59	**21.52**	21.38	**22.5**
			16QAM	20.62	20.56	20.43	**21.5**
		Low	QPSK	21.54	21.41	21.43	**22.5**
			16QAM	20.46	20.44	20.38	**21.5**
	100RB	/	QPSK	21.61	21.48	21.48	**22.5**
			16QAM	20.43	20.39	20.41	**21.5**

LTE-FDD Band 4				Actual output Power (dBm)			Tune up
Band-width	RB allocation	RB offset	Modulation	High	Middle	Low	
1.4 MHz				1754.3MHz	1732.5MHz	1710.7MHz	
	1RB	High	QPSK	21.83	22.24	22.12	**23.5**
			16QAM	20.82	20.98	21.10	**22.5**
		Middle	QPSK	22.02	22.30	22.35	**23.5**
			16QAM	20.98	21.09	21.34	**22.5**
		Low	QPSK	21.83	22.27	22.35	**23.5**
			16QAM	20.67	21.06	21.09	**22.5**
	3RB	High	QPSK	22.20	22.40	22.42	**23.5**
			16QAM	21.10	21.24	21.30	**22.5**
		Middle	QPSK	22.23	22.66	22.53	**23.5**
			16QAM	21.09	21.34	21.30	**22.5**
		Low	QPSK	22.07	22.58	22.47	**23.5**
			16QAM	21.04	21.40	21.32	**22.5**
	6RB	/	QPSK	21.31	21.47	21.46	**22.5**
			16QAM	20.06	20.30	20.24	**21.5**
3 MHz				1753.5MHz	1732.5MHz	1711.5MHz	/
	1RB	High	QPSK	22.00	22.29	22.40	**23.5**
			16QAM	20.87	21.10	21.53	**22.5**
		Middle	QPSK	21.88	22.49	22.32	**23.5**
			16QAM	21.00	21.05	21.32	**22.5**
		Low	QPSK	21.94	22.45	22.31	**23.5**
			16QAM	20.76	21.14	21.19	**22.5**
	8RB	High	QPSK	21.16	21.42	21.58	**22.5**
			16QAM	20.33	20.62	20.72	**21.5**
		Middle	QPSK	21.20	21.46	21.63	**22.5**
			16QAM	20.32	20.73	20.77	**21.5**
		Low	QPSK	21.24	21.51	21.47	**22.5**
			16QAM	20.25	20.59	20.55	**21.5**
	15RB	/	QPSK	21.21	21.53	21.50	**22.5**
			16QAM	20.12	20.52	20.48	**21.5**

LTE-FDD Band 4				Actual output Power (dBm)			Tune up
Band-width	RB allocation	RB offset	Modulation	High	Middle	Low	
5 MHz				1752.5MHz	1732.5MHz	1712.5MHz	
	1RB	High	QPSK	21.83	22.14	22.38	**23.5**
			16QAM	21.25	20.82	20.94	**22.5**
		Middle	QPSK	21.81	22.23	22.43	**23.5**
			16QAM	20.90	21.09	21.26	**22.5**
		Low	QPSK	22.11	22.30	22.38	**23.5**
			16QAM	20.99	21.20	21.06	**22.5**
	12RB	High	QPSK	21.19	21.45	21.50	**22.5**
			16QAM	20.12	20.19	20.30	**21.5**
		Middle	QPSK	21.16	21.56	21.46	**22.5**
			16QAM	20.10	20.30	20.38	**21.5**
		Low	QPSK	21.18	21.51	21.54	**22.5**
			16QAM	20.26	20.27	20.37	**21.5**
	25RB	/	QPSK	21.09	21.44	21.48	**22.5**
			16QAM	20.18	20.44	20.49	**21.5**
10 MHz				1750MHz	1732.5MHz	1715MHz	/
	1RB	High	QPSK	22.16	22.35	22.29	**23.5**
			16QAM	21.04	20.83	21.00	**22.5**
		Middle	QPSK	22.34	22.38	22.45	**23.5**
			16QAM	21.17	21.20	21.28	**22.5**
		Low	QPSK	22.33	22.43	22.17	**23.5**
			16QAM	20.79	21.12	21.17	**22.5**
	25RB	High	QPSK	21.26	21.36	21.53	**22.5**
			16QAM	20.18	20.37	20.56	**21.5**
		Middle	QPSK	21.29	21.49	21.54	**22.5**
			16QAM	20.30	20.46	20.56	**21.5**
		Low	QPSK	21.31	21.55	21.50	**22.5**
			16QAM	20.26	20.38	20.51	**21.5**
	50RB	/	QPSK	21.24	21.45	21.52	**22.5**
			16QAM	20.25	20.40	20.50	**21.5**

LTE-FDD Band 4				Actual output Power (dBm)			Tune up
Band-width	RB allocation	RB offset	Modulation	High	Middle	Low	
15 MHz				1747.5MHz	1732.5MHz	1717.5MHz	
	1RB	High	QPSK	22.06	21.99	22.30	**23.5**
			16QAM	20.95	20.98	20.93	**22.5**
		Middle	QPSK	22.16	22.32	22.48	**23.5**
			16QAM	21.03	21.09	21.22	**22.5**
		Low	QPSK	22.29	22.33	22.36	**23.5**
			16QAM	21.03	21.03	21.07	**22.5**
	25RB	High	QPSK	21.16	21.41	21.47	**22.5**
			16QAM	20.18	20.43	20.41	**21.5**
		Middle	QPSK	21.25	21.43	21.58	**22.5**
			16QAM	20.28	20.45	20.52	**21.5**
		Low	QPSK	21.21	21.47	21.51	**22.5**
			16QAM	20.29	20.40	20.44	**21.5**
	50RB	/	QPSK	21.13	21.43	21.45	**22.5**
			16QAM	20.23	20.37	20.48	**21.5**
20 MHz				1745MHz	1732.5MHz	1720MHz	/
	1RB	High	QPSK	22.01	22.25	22.37	**23.5**
			16QAM	20.75	21.54	20.81	**22.5**
		Middle	QPSK	**22.42**	**22.53**	**22.54**	**23.5**
			16QAM	21.12	21.84	21.13	**22.5**
		Low	QPSK	22.30	22.23	22.43	**23.5**
			16QAM	21.38	21.80	20.79	**22.5**
	50RB	High	QPSK	21.22	21.53	21.54	**22.5**
			16QAM	20.17	20.56	20.52	**21.5**
		Middle	QPSK	21.44	**21.61**	21.58	**22.5**
			16QAM	20.26	20.68	20.66	**21.5**
		Low	QPSK	21.55	21.59	21.62	**22.5**
			16QAM	20.59	20.66	20.57	**21.5**
	100RB	/	QPSK	21.45	**21.63**	21.55	**22.5**
			16QAM	20.48	20.68	20.49	**21.5**

LTE-FDD Band 5				Actual output Power (dBm)			Tune up
Band-width	RB allocation	RB offset	Modulation	High	Middle	Low	
1.4 MHz				848.3MHz	836.5MHz	824.7MHz	
	1RB	High	QPSK	22.29	22.46	22.53	**24**
			16QAM	21.08	21.13	20.67	**22.5**
		Middle	QPSK	22.50	22.61	22.48	**24**
			16QAM	21.09	21.37	20.93	**22.5**
		Low	QPSK	22.46	22.47	22.47	**24**
			16QAM	21.15	21.15	20.68	**22.5**
	3RB	High	QPSK	22.75	22.65	22.71	**24**
			16QAM	21.56	21.56	21.57	**22.5**
		Middle	QPSK	22.86	22.70	22.77	**24**
			16QAM	21.54	21.78	21.52	**22.5**
		Low	QPSK	22.78	22.65	22.59	**24**
			16QAM	21.44	21.55	21.49	**22.5**
	6RB	/	QPSK	21.70	21.56	21.58	**24**
			16QAM	20.37	20.36	20.42	**22.5**
3 MHz				847.5MHz	836.5MHz	825.5MHz	/
	1RB	High	QPSK	22.43	22.62	22.63	**24**
			16QAM	21.31	20.93	21.20	**22.5**
		Middle	QPSK	22.40	22.44	22.61	**24**
			16QAM	21.27	21.21	21.35	**22.5**
		Low	QPSK	22.43	22.36	22.59	**24**
			16QAM	21.31	21.20	20.79	**22.5**
	8RB	High	QPSK	21.69	21.60	21.77	**23**
			16QAM	20.70	20.65	20.83	**21.5**
		Middle	QPSK	21.62	21.65	21.76	**23**
			16QAM	20.73	20.65	20.79	**21.5**
		Low	QPSK	21.66	21.55	21.72	**23**
			16QAM	20.70	20.55	20.68	**21.5**
	15RB	/	QPSK	21.65	21.64	21.69	**23**
			16QAM	20.65	20.50	20.73	**21.5**

LTE-FDD Band 5				Actual output Power (dBm)			Tune up
Band-width	RB allocation	RB offset	Modulation	High	Middle	Low	
5 MHz				846.5MHz	836.5MHz	826.5MHz	
	1RB	High	QPSK	22.70	22.60	22.71	**24**
			16QAM	20.91	21.06	21.30	**22.5**
		Middle	QPSK	22.82	22.56	22.75	**24**
			16QAM	21.44	21.14	21.40	**22.5**
		Low	QPSK	22.62	22.49	22.53	**24**
			16QAM	21.04	21.22	20.96	**22.5**
	12RB	High	QPSK	21.78	21.60	21.76	**23**
			16QAM	20.63	20.56	20.54	**21.5**
		Middle	QPSK	21.74	21.68	21.78	**23**
			16QAM	20.49	20.47	20.65	**21.5**
		Low	QPSK	21.70	21.67	21.70	**23**
			16QAM	20.52	20.51	20.74	**21.5**
	25RB	/	QPSK	21.72	21.72	21.68	**23**
			16QAM	20.72	20.67	20.68	**21.5**
10 MHz				844MHz	836.5MHz	829MHz	/
	1RB	High	QPSK	22.72	22.61	22.69	**24**
			16QAM	21.24	21.41	21.24	**22.5**
		Middle	QPSK	22.86	22.73	22.82	**24**
			16QAM	21.18	21.49	21.49	**22.5**
		Low	QPSK	22.87	**22.80**	22.62	**24**
			16QAM	21.01	21.51	21.39	**22.5**
	25RB	High	QPSK	21.83	**21.89**	21.84	**23**
			16QAM	20.82	20.78	20.80	**21.5**
		Middle	QPSK	21.83	21.80	21.84	**23**
			16QAM	20.82	20.77	20.82	**21.5**
		Low	QPSK	21.91	21.84	21.80	**23**
			16QAM	20.89	20.82	20.82	**21.5**
	50RB	/	QPSK	21.83	21.81	21.86	**23**
			16QAM	20.73	20.82	20.81	**21.5**

LTE-FDD Band 7				Actual output Power (dBm)			Tune up
Band-width	RB allocation	RB offset	Modulation	High	Middle	Low	
5 MHz				2567.4MHz	2535MHz	2502.5MHz	
	1RB	High	QPSK	21.67	21.78	21.44	23
			16QAM	20.10	20.24	20.03	22
		Middle	QPSK	21.90	21.83	21.81	23
			16QAM	20.41	20.05	20.40	22
		Low	QPSK	21.85	21.50	21.65	23
			16QAM	20.05	20.13	20.21	22
	12RB	High	QPSK	20.79	20.69	20.73	22
			16QAM	19.70	19.48	19.41	21
		Middle	QPSK	20.81	20.69	20.65	22
			16QAM	19.94	19.65	19.45	21
		Low	QPSK	20.82	20.70	20.64	22
			16QAM	19.82	19.76	19.54	21
	25RB	/	QPSK	20.75	20.64	20.58	22
			16QAM	19.74	19.77	19.68	21
10 MHz				2565MHz	2535MHz	2505MHz	/
	1RB	High	QPSK	21.93	21.63	21.56	23
			16QAM	20.29	20.18	20.18	22
		Middle	QPSK	22.05	21.79	21.80	23
			16QAM	20.69	20.47	20.27	22
		Low	QPSK	21.95	21.67	21.64	23
			16QAM	20.36	20.25	20.28	22
	25RB	High	QPSK	20.85	20.66	20.67	22
			16QAM	19.98	19.68	19.61	21
		Middle	QPSK	20.87	20.62	20.71	22
			16QAM	19.98	19.72	19.75	21
		Low	QPSK	20.83	20.65	20.62	22
			16QAM	19.88	19.74	19.65	21
	50RB	/	QPSK	20.76	20.70	20.66	22
			16QAM	19.91	19.78	19.62	21

LTE-FDD Band 7				Actual output Power (dBm)			Tune up
Band-width	RB allocation	RB offset	Modulation	High	Middle	Low	
15 MHz				2562.5MHz	2535MHz	2507.5MHz	
	1RB	High	QPSK	21.77	21.82	21.64	**23**
			16QAM	20.18	20.85	20.34	**22**
		Middle	QPSK	21.74	21.73	21.67	**23**
			16QAM	20.50	20.37	20.29	**22**
		Low	QPSK	21.68	21.62	21.76	**23**
			16QAM	20.34	20.16	20.31	**22**
	25RB	High	QPSK	20.75	20.73	20.65	**22**
			16QAM	19.86	19.69	19.60	**21**
		Middle	QPSK	20.80	20.65	20.71	**22**
			16QAM	19.94	19.69	19.67	**21**
		Low	QPSK	20.77	20.65	20.72	**22**
			16QAM	19.85	19.68	19.67	**21**
	50RB	/	QPSK	20.79	20.66	20.67	**22**
			16QAM	19.91	19.79	19.63	**21**
20 MHz				2560MHz	2535MHz	2510MHz	/
	1RB	High	QPSK	21.91	22.00	21.49	**23**
			16QAM	20.36	21.01	20.27	**22**
		Middle	QPSK	22.26	**22.21**	21.80	**23**
			16QAM	20.85	21.31	20.38	**22**
		Low	QPSK	21.97	21.85	21.62	**23**
			16QAM	20.56	20.87	20.20	**22**
	50RB	High	QPSK	21.09	**20.93**	20.74	**22**
			16QAM	20.07	20.01	19.71	**21**
		Middle	QPSK	21.04	20.90	20.67	**22**
			16QAM	20.19	20.05	19.71	**21**
		Low	QPSK	20.93	20.79	20.72	**22**
			16QAM	20.09	19.82	19.58	**21**
	100RB	/	QPSK	21.01	20.93	20.69	**22**
			16QAM	20.13	19.96	19.64	**21**

11.5 Wi-Fi and BT Measurement result

Table 11.6: The conducted Power measurement results for BT

BT	Tune up	Averaged Power (dBm)		
Mode		Ch0 (2402 MHz)	Ch39 (2441 MHz)	Ch78 (2480 MHz)
GFSK	**9.5**	9.42	9.39	9.32
EDR2M-4_DQPSK	**9.5**	8.89	8.52	8.29
EDR3M-8DPSK	**9.5**	8.78	8.50	8.23
BLE	**Tune up**	Ch0（2402MHz）	Ch19（2441MHz）	Ch39（2480MHz）
	2	1.55	1.38	1.25

Table 11.7: The conducted Power measurement results for 2.4G WIFI

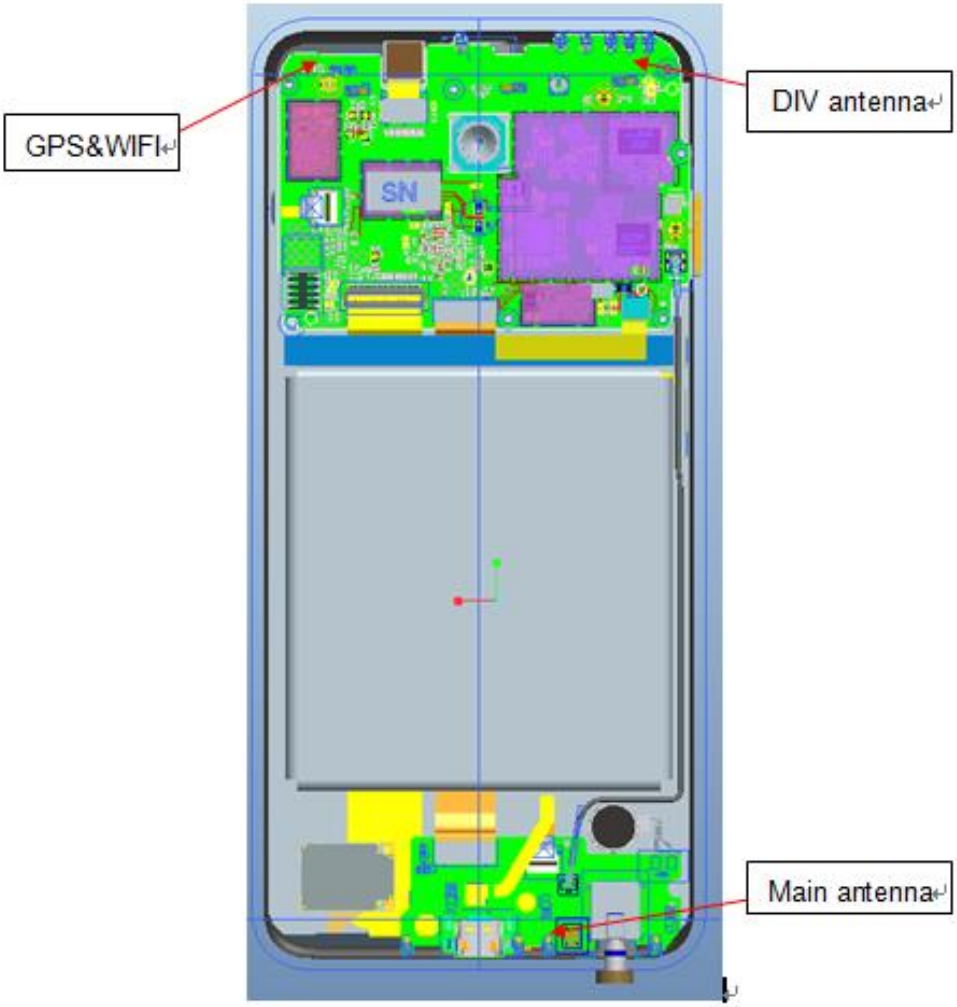
WiFi 2.4GHz	Tune up	Averaged Power (dBm)		
Mode		Ch 1(2412 MHz)	Ch 6(2437Mhz)	Ch 11(2462MHz)
802.11b	**17**	16.20	16.43	16.42
802.11g	**15**	14.43	14.66	14.63
802.11n(20MHz)	**14**	12.93	12.98	12.86

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, 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	Yes	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	2.45	Head	9.58	17	50.12	No
		Body	19.17	17	50.12	No

13 Evaluation of Simultaneous

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

	Position	Main antenna	WiFi	Sum
Highest reported SAR value for Head	Left Touch	0.52	0.46	**0.98**
Highest reported SAR value for Body	Rear	1.36	0.14	**1.50**

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

	Position	Main antenna	BT*	Sum
Highest reported SAR value for Head	Left Touch	0.52	0.37	**0.89**
Highest reported SAR value for Body	Rear	1.36	0.21	**1.57**

BT* - Estimated SAR for Bluetooth (see the table 13.3)

Table 13.3: Estimated SAR for Bluetooth

Position	f (GHz)	Distance (mm)	Upper limit of power *		Estimated$_{1g}$ (W/kg)
			dBm	mW	
Head	2.441	5	9.5	8.91	0.37
Body	2.441	10	9.5	8.91	0.21

* - 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 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-g SAR is the highest measured SAR in each exposure configuration, wireless mode and frequency band combination or >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 for GSM850/1900	1:2.67
CDMA BC0	1:1
WCDMA850/1700/1900	1:1
FDD_LTE Band 2/4/5/7	1:1

Note:
EUT1 & 4(Battery): BA810 （ DONG GUAN DER NEW ENERGY CO.,LTD. ）
EUT2(Battery): BA810 （ Ningbo Veken Battery Co., Ltd.）
EUT3(Battery): BA810 （ Sunwoda Electronic CO.,LTD. ）

14.1 SAR results

Table 14.2: SAR Values (GSM 850 - Head)

Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
836.6	190	Speech	Left Touch	**Fig.1**	32.67	34	**0.194**	**0.26**	0.03
836.6	190	Speech	Left Tilt	/	32.67	34	0.103	**0.14**	0.09
836.6	190	Speech	Right Touch	/	32.67	34	0.175	**0.24**	0.09
836.6	190	Speech	Right Tilt	/	32.67	34	0.124	**0.17**	0.07
836.6	190	Speech	Left Touch	EUT2	32.67	34	0.160	**0.22**	0.04
836.6	190	Speech	Left Touch	EUT3	32.67	34	0.106	**0.14**	0.07

Table 14.3: SAR Values (GSM 850 -Body)

Ambient Temperature: 22.8°C Liquid Temperature: 22.2°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
Hotspot/Body Worn Test Data (10mm)									
836.6	190	GPRS	Front	/	29.92	30	0.194	**0.20**	-0.16
836.6	190	GPRS	Rear	/	29.92	30	0.295	**0.30**	0.03
836.6	190	GPRS	Left	/	29.92	30	0.084	**0.09**	0.02
836.6	190	GPRS	Right	/	29.92	30	0.154	**0.16**	0.01
836.6	190	GPRS	Bottom	/	29.92	30	0.029	**0.03**	0.02
836.6	190	GPRS	Rear	EUT2	29.92	30	0.295	**0.30**	-0.13
836.6	190	GPRS	Rear	**Fig.2** /EUT3	29.92	30	**0.344**	**0.35**	-0.14

Table 14.4: SAR Values (GSM 1900 - Head)

Ambient Temperature: 22.7°C Liquid Temperature: 22.2°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
1880	661	Speech	Left Touch	/	30.06	31	0.057	**0.07**	0.09
1880	661	Speech	Left Tilt	/	30.06	31	0.067	**0.08**	0.02
1880	661	Speech	Right Touch	/	30.06	31	0.071	**0.09**	0.07
1880	661	Speech	Right Tilt	/	30.06	31	0.039	**0.05**	-0.07
1880	661	Speech	Right Touch	EUT2	30.06	31	0.143	**0.18**	0.07
1880	661	Speech	Right Touch	**Fig.3** /EUT3	30.06	31	**0.148**	**0.18**	0.07

Table 14.5: SAR Values (GSM 1900 - Body)

Ambient Temperature: 22.4°C Liquid Temperature: 22.0°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
Hotspot/Body Worn Test Data (10mm)									
1880	661	GPRS	Front	/	26.94	28	0.119	**0.15**	0.06
1880	661	GPRS	Rear	/	26.94	28	0.434	**0.55**	0.07
1880	661	GPRS	Left	/	26.94	28	0.019	**0.02**	0.02
1880	661	GPRS	Right	/	26.94	28	0.048	**0.06**	0.03
1880	661	GPRS	Bottom	/	26.94	28	0.475	**0.61**	0.02
1880	661	GPRS	Bottom	**Fig.4** /EUT2	26.94	28	**0.497**	**0.63**	0.17
1880	661	GPRS	Bottom	EUT3	26.94	28	0.442	**0.56**	0.09

Table 14.6: SAR Values (CDMA BC0 - Head)

Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
836.5	384	SO55	Left Touch	**Fig.5**	23.39	24	**0.453**	**0.52**	-0.01
836.5	384	SO55	Left Tilt	/	23.39	24	0.269	**0.31**	-0.02
836.5	384	SO55	Right Touch	/	23.39	24	0.432	**0.50**	0.01
836.5	384	SO55	Right Tilt	/	23.39	24	0.248	**0.29**	0.02
836.5	384	SO55	Left Touch	EUT2	23.39	24	0.366	**0.42**	-0.02
836.5	384	SO55	Left Touch	EUT3	23.39	24	0.296	**0.34**	-0.07

Table 14.7: SAR Values (CDMA BC0 -Body)

Ambient Temperature: 22.8°C Liquid Temperature: 22.2°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
Hotspot/Body Worn Test Data (10mm)									
836.5	384	SO32	Front	/	23.41	24	0.336	**0.38**	-0.10
836.5	384	SO32	Rear	**Fig.6**	23.41	24	**0.559**	**0.64**	-0.05
836.5	384	SO32	Left	/	23.41	24	0.059	**0.07**	0.06
836.5	384	SO32	Right	/	23.41	24	0.294	**0.34**	0.01
836.5	384	SO32	Bottom	/	23.41	24	0.056	**0.06**	-0.04
836.5	384	SO32	Rear	EUT2	23.41	24	0.532	**0.61**	-0.01
836.5	384	SO32	Rear	EUT3	23.41	24	0.429	**0.49**	0.08

Table 14.8: SAR Values (WCDMA 850 - Head)

Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
836.4	4182	RMC	Left Touch	**Fig.7**	22.1	23	**0.376**	**0.46**	0.05
836.4	4182	RMC	Left Tilt	/	22.1	23	0.236	**0.29**	-0.10
836.4	4182	RMC	Right Touch	/	22.1	23	0.352	**0.43**	0.09
836.4	4182	RMC	Right Tilt	/	22.1	23	0.219	**0.27**	0.03
836.4	4182	RMC	Left Touch	EUT2	22.1	23	0.264	**0.32**	-0.04
836.4	4182	RMC	Left Touch	EUT3	22.1	23	0.260	**0.32**	-0.09

Table 14.9: SAR Values (WCDMA 850 -Body)

Ambient Temperature: 22.8°C Liquid Temperature: 22.2°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
Hotspot/Body Worn Test Data (10mm)									
836.4	4182	RMC	Front	/	22.1	23	0.373	**0.46**	-0.03
836.4	4182	RMC	Rear	**Fig.8**	22.1	23	**0.523**	**0.64**	0.00
836.4	4182	RMC	Left	/	22.1	23	0.174	**0.21**	-0.12
836.4	4182	RMC	Right	/	22.1	23	0.188	**0.23**	-0.01
836.4	4182	RMC	Bottom	/	22.1	23	0.055	**0.07**	0.01
836.4	4182	RMC	Rear	EUT2	22.1	23	0.505	**0.62**	0.09
836.4	4182	RMC	Rear	EUT3	22.1	23	0.477	**0.59**	0.03

Table 14.10: SAR Values (WCDMA1900 - Head)

Ambient Temperature: 22.7°C Liquid Temperature: 22.2°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
1880	9400	RMC	Left Touch	/	22.5	23	0.012	**0.01**	0.09
1880	9400	RMC	Left Tilt	/	22.5	23	0.125	**0.14**	0.07
1880	9400	RMC	Right Touch	/	22.5	23	0.151	**0.17**	-0.03
1880	9400	RMC	Right Tilt	/	22.5	23	0.087	**0.10**	-0.09
1880	9400	RMC	Right Touch	EUT2	22.5	23	0.216	**0.24**	-0.02
1880	9400	RMC	Right Touch	**Fig.9** /EUT3	22.5	23	**0.305**	**0.34**	0.02

Table 14.11: SAR Values (WCDMA1900 - Body)

Ambient Temperature: 22.4°C Liquid Temperature: 22.0°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
Hotspot/Body Worn Test Data (10mm)									
1880	9400	RMC	Front	/	22.5	23	0.297	**0.33**	-0.02
1880	9400	RMC	Rear	/	22.5	23	0.510	**0.57**	0.00
1880	9400	RMC	Left	/	22.5	23	0.055	**0.06**	0.03
1880	9400	RMC	Right	/	22.5	23	0.042	**0.05**	0.02
1880	9400	RMC	Bottom	**Fig.10**	22.5	23	**0.516**	**0.58**	-0.11
1880	9400	RMC	Bottom	EUT2	22.5	23	0.477	**0.54**	0.07
1880	9400	RMC	Bottom	EUT3	22.5	23	0.485	**0.54**	-0.11

Table 14.12: SAR Values (WCDMA 1700 - Head)

Ambient Temperature: 22.9°C Liquid Temperature: 22.4°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
1732.6	1413	RMC	Left Touch	/	22.2	23	0.010	**0.01**	0.05
1732.6	1413	RMC	Left Tilt	/	22.2	23	0.021	**0.02**	0.01
1732.6	1413	RMC	Right Touch	/	22.2	23	0.039	**0.05**	0.06
1732.6	1413	RMC	Right Tilt	/	22.2	23	0.022	**0.03**	0.05
1732.6	1413	RMC	Right Touch	**Fig.11** /EUT2	22.2	23	**0.065**	**0.08**	-0.11
1732.6	1413	RMC	Right Touch	EUT3	22.2	23	0.060	**0.07**	-0.08

Table 14.13: SAR Values (WCDMA 1700 - Body)

Ambient Temperature: 22.6°C Liquid Temperature: 22.1°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
Hotspot/Body Worn Test Data (10mm)									
1732.6	1413	RMC	Front	/	22.2	23	0.242	**0.29**	0.15
1732.6	1413	RMC	Rear	/	22.2	23	0.580	**0.70**	0.15
1732.6	1413	RMC	Left	/	22.2	23	0.020	**0.02**	0.10
1732.6	1413	RMC	Right	/	22.2	23	0.043	**0.05**	0.03
1732.6	1413	RMC	Bottom	/	22.2	23	0.745	**0.90**	-0.02
1752.6	1513	RMC	Bottom	/	22.1	23	0.610	**0.75**	0.02
1712.4	1312	RMC	Bottom	/	22.4	23	1.090	**1.25**	0.03
1712.4	1312	RMC	Bottom	**Fig.12** /EUT2	22.4	23	**1.150**	**1.32**	0.01
1712.4	1312	RMC	Bottom	EUT3	22.4	23	1.040	**1.24**	-0.17

Table 14.14: SAR Values (LTE Band 2 - Head)

Ambient Temperature: 22.7°C Liquid Temperature: 22.2°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
1880	18900	1RB_Low	Left Touch	/	22.48	23.5	0.118	**0.15**	0.08
1880	18900	50RB_Mid	Left Touch	/	21.52	22.5	0.114	**0.14**	0.02
1880	18900	1RB_Low	Left Tilt	/	22.48	23.5	0.112	**0.14**	0.07
1880	18900	50RB_Mid	Left Tilt	/	21.52	22.5	0.095	**0.12**	0.01
1880	18900	1RB_Low	Right Touch	/	22.48	23.5	0.153	**0.19**	0.05
1880	18900	50RB_Mid	Right Touch	/	21.52	22.5	0.138	**0.17**	0.05
1880	18900	1RB_Low	Right Tilt	/	22.48	23.5	0.088	**0.11**	0.03
1880	18900	50RB_Mid	Right Tilt	/	21.52	22.5	0.085	**0.11**	-0.10
1880	18900	1RB_Low	Right Touch	**Fig.13** /EUT2	22.48	23.5	**0.208**	**0.26**	0.03
1880	18900	1RB_Low	Right Touch	EUT3	22.48	23.5	0.179	**0.23**	0.01

Table 14.15: SAR Values (LTE Band 2 - Body)

Ambient Temperature: 22.4°C Liquid Temperature: 22.0°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
Hotspot/Body Worn Test Data (10mm)									
1880	18900	1RB_Low	Front	/	22.48	23.5	0.209	**0.26**	0.00
1880	18900	50RB_Mid	Front	/	21.52	22.5	0.173	**0.22**	-0.03
1880	18900	1RB_Low	Rear	**Fig.14**	22.48	23.5	**0.506**	**0.64**	-0.10
1880	18900	50RB_Mid	Rear	/	21.52	22.5	0.426	**0.53**	0.09
1880	18900	1RB_Low	Left	/	22.48	23.5	0.059	**0.07**	0.00
1880	18900	50RB_Mid	Left	/	21.52	22.5	0.048	**0.06**	0.01
1880	18900	1RB_Low	Right	/	22.48	23.5	0.024	**0.03**	0.08
1880	18900	50RB_Mid	Right	/	21.52	22.5	0.034	**0.04**	0.01
1880	18900	1RB_Low	Bottom	/	22.48	23.5	0.447	**0.57**	0.14
1880	18900	50RB_Mid	Bottom	/	21.52	22.5	0.371	**0.46**	0.03
1880	18900	1RB_Low	Rear	EUT2	22.48	23.5	0.502	**0.63**	-0.08
1880	18900	1RB_Low	Rear	EUT3	22.48	23.5	0.475	**0.60**	-0.02

Table 14.16: SAR Values (LTE Band 4 - Head)

Ambient Temperature: 22.9°C Liquid Temperature: 22.4°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
1732.5	20175	1RB_Mid	Left Touch	/	22.53	23.5	0.025	0.03	0.03
1732.5	20175	50RB_Mid	Left Touch	/	21.61	22.5	0.020	0.02	0.05
1732.5	20175	1RB_Mid	Left Tilt	/	22.53	23.5	0.027	0.03	-0.07
1732.5	20175	50RB_Mid	Left Tilt	/	21.61	22.5	0.023	0.03	0.05
1732.5	20175	1RB_Mid	Right Touch	/	22.53	23.5	0.055	0.07	-0.05
1732.5	20175	50RB_Mid	Right Touch	/	21.61	22.5	0.040	0.05	-0.03
1732.5	20175	1RB_Mid	Right Tilt	/	22.53	23.5	0.020	0.02	0.01
1732.5	20175	50RB_Mid	Right Tilt	/	21.61	22.5	0.016	0.02	0.05
1732.5	20175	1RB_Mid	Right Touch	**Fig.15** /EUT2	22.53	23.5	**0.068**	**0.08**	0.09
1732.5	20175	1RB_Mid	Right Touch	EUT3	22.53	23.5	0.064	**0.08**	-0.01

Table 14.17: SAR Values (LTE Band 4 - Body)

Ambient Temperature: 22.6°C Liquid Temperature: 22.1°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
Hotspot/Body Worn Test Data (10mm)									
1732.5	20175	1RB_Mid	Front	/	22.53	23.5	0.221	**0.28**	-0.08
1732.5	20175	50RB_Mid	Front	/	21.61	22.5	0.176	**0.22**	-0.02
1732.5	20175	1RB_Mid	Rear	/	22.53	23.5	0.860	**1.08**	0.05
1732.5	20175	50RB_Mid	Rear	/	21.61	22.5	0.647	**0.79**	0.07
1732.5	20175	1RB_Mid	Left	/	22.53	23.5	0.029	**0.04**	0.01
1732.5	20175	50RB_Mid	Left	/	21.61	22.5	0.040	**0.05**	0.05
1732.5	20175	1RB_Mid	Right	/	22.53	23.5	0.030	**0.04**	0.05
1732.5	20175	50RB_Mid	Right	/	21.61	22.5	0.023	**0.03**	0.05
1732.5	20175	1RB_Mid	Bottom	/	22.53	23.5	0.615	**0.77**	0.06
1732.5	20175	50RB_Mid	Bottom	/	21.61	22.5	0.484	**0.59**	0.02
1745	20300	1RB_Mid	Rear	/	22.42	23.5	0.670	**0.86**	0.03
1720	20050	1RB_Mid	Rear	/	22.54	23.5	0.989	**1.23**	0.00
1732.5	20175	100RB	Rear	/	21.63	22.5	0.667	**0.81**	0.01
1720	20050	1RB_Mid	Rear	**Fig.16** /EUT2	22.54	23.5	**1.090**	**1.36**	-0.01
1720	20050	1RB_Mid	Rear	EUT3	22.54	23.5	0.947	**1.18**	-0.09
1720	20050	1RB_Mid	Rear Headset	EUT2	22.54	23.5	1.020	**1.27**	0.05

Table 14.18: SAR Values (LTE Band 5 - Head)

Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
836.5	20525	1RB_Low	Left Touch	/	22.80	24	0.290	0.38	-0.09
836.5	20525	25RB_High	Left Touch	**Fig.17**	21.89	22.5	**0.373**	**0.43**	0.08
836.5	20525	1RB_Low	Left Tilt	/	22.80	24	0.156	0.21	0.05
836.5	20525	25RB_High	Left Tilt	/	21.89	22.5	0.209	0.24	0.05
836.5	20525	1RB_Low	Right Touch	/	22.80	24	0.251	0.33	0.05
836.5	20525	25RB_High	Right Touch	/	21.89	22.5	0.342	0.39	0.05
836.5	20525	1RB_Low	Right Tilt	/	22.80	24	0.167	0.22	0.06
836.5	20525	25RB_High	Right Tilt	/	21.89	22.5	0.212	0.24	0.01
836.5	20525	25RB_High	Left Touch	EUT2	21.89	22.5	0.276	0.32	0.09
836.5	20525	25RB_High	Left Touch	EUT3	21.89	22.5	0.205	0.24	0.02

Table 14.19: SAR Values (LTE Band 5 - Body)

Ambient Temperature: 22.8°C Liquid Temperature: 22.2°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
Hotspot/Body Worn Test Data (10mm)									
836.5	20525	1RB_Low	Front	/	22.80	24	0.260	0.34	0.05
836.5	20525	25RB_High	Front	/	21.89	22.5	0.335	0.39	-0.08
836.5	20525	1RB_Low	Rear	/	22.80	24	0.388	0.51	0.03
836.5	20525	25RB_High	Rear	**Fig.18**	21.89	22.5	**0.451**	**0.52**	0.01
836.5	20525	1RB_Low	Left	/	22.80	24	0.215	0.28	-0.04
836.5	20525	25RB_High	Left	/	21.89	22.5	0.258	0.30	-0.06
836.5	20525	1RB_Low	Right	/	22.80	24	0.148	0.20	-0.07
836.5	20525	25RB_High	Right	/	21.89	22.5	0.186	0.21	-0.09
836.5	20525	1RB_Low	Bottom	/	22.80	24	0.031	0.04	0.06
836.5	20525	25RB_High	Bottom	**/**	21.89	22.5	0.043	0.05	-0.07
836.5	20525	25RB_High	Rear	EUT2	21.89	23	0.398	0.51	-0.05
836.5	20525	25RB_High	Rear	EUT3	21.89	22.5	0.376	0.43	-0.10

Table 14.20: SAR Values (LTE Band 7 - Head)

Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
2535	21100	1RB_Mid	Left Touch	/	22.21	23	0.051	0.06	0.04
2535	21100	50RB_High	Left Touch	/	20.93	22	0.039	0.05	0.01
2535	21100	1RB_Mid	Left Tilt	/	22.21	23	0.065	0.08	0.01
2535	21100	50RB_High	Left Tilt	/	20.93	22	0.036	0.05	0.05
2535	21100	1RB_Mid	Right Touch	/	22.21	23	0.116	0.14	0.05
2535	21100	50RB_High	Right Touch	/	20.93	22	0.060	0.08	0.01
2535	21100	1RB_Mid	Right Tilt	/	22.21	23	0.017	0.02	0.09
2535	21100	50RB_High	Right Tilt	/	20.93	22	0.012	0.02	0.08
2535	21100	1RB_Mid	Right Touch	EUT2	22.21	23	0.126	0.15	0.01
2535	21100	1RB_Mid	Right Touch	**Fig.19** /EUT3	22.21	23	**0.144**	**0.17**	0.03

Table 14.21: SAR Values (LTE Band 7 - Body)

Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C									
Frequency		Test Mode	Test Position	Figure No. / Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
Hotspot/Body Worn Test Data (10mm)									
2535	21100	1RB_Mid	Front	/	22.21	23	0.240	**0.29**	-0.15
2535	21100	50RB_High	Front	/	20.93	22	0.179	**0.23**	0.07
2535	21100	1RB_Mid	Rear	**Fig.20**	22.21	23	**0.615**	**0.74**	-0.03
2535	21100	50RB_High	Rear	/	20.93	22	0.388	**0.50**	0.05
2535	21100	1RB_Mid	Left	/	22.21	23	0.045	**0.05**	0.04
2535	21100	50RB_High	Left	/	20.93	22	0.036	**0.05**	0.09
2535	21100	1RB_Mid	Right	/	22.21	23	0.080	**0.10**	0.06
2535	21100	50RB_High	Right	/	20.93	22	0.059	**0.08**	0.03
2535	21100	1RB_Mid	Bottom	/	22.21	23	0.307	**0.37**	-0.09
2535	21100	50RB_High	Bottom	/	20.93	22	0.216	**0.28**	-0.02
2535	21100	1RB_Mid	Rear	EUT2	22.21	23	0.578	**0.69**	-0.19
2535	21100	1RB_Mid	Rear	EUT3	22.21	23	0.593	**0.71**	0.13

14.2 WLAN Evaluation for 2.4G

According to the KDB248227 D01, SAR is measured for 2.4GHz 802.11b DSSS using the initial test position procedure.

Head Evaluation

Table 14.22: SAR Values (WLAN - Head)–802.11b 1Mbps

Ambient Temperature: 22.6°C Liquid Temperature: 22.0°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
2437	6	802.11 b	Left Touch	/	16.43	17	0.338	**0.39**	0.05
2437	6	802.11 b	Left Tilt	/	16.43	17	0.235	**0.27**	0.02
2437	6	802.11 b	Right Touch	/	16.43	17	0.159	**0.18**	0.05
2437	6	802.11 b	Right Tilt	/	16.43	17	0.152	**0.17**	0.01
2437	6	802.11 b	Left Touch	EUT2	16.43	17	0.377	**0.43**	0.08
2437	6	802.11 b	Left Touch	**Fig.21** /EUT3	16.43	17	**0.400**	**0.46**	-0.07

Note1:For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

According to the KDB248227 D01, The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. A maximum transmission duty factor of 100% is achievable for WLAN in this project and the scaled reported SAR is presented as below.

Table 14.23: SAR Values (WLAN - Head) – 802.11b 1Mbps (Scaled Reported SAR)

Ambient Temperature: 22.6°C Liquid Temperature: 22.0°C							
Frequency		Side	Test Position	Actual duty factor	maximum duty factor	Reported SAR (1g)(W/kg)	Scaled reported SAR (1g)(W/kg)
MHz	Ch.						
2437	6	Left	Touch	100%	100%	0.46	**0.46**
2437	6	Right	Touch	100%	100%	0.18	**0.18**

SAR is not required for OFDM because the 802.11b adjusted SAR ≤ 1.2 W/kg.

Body Evaluation

Table 14.24: SAR Values (WLAN - Body)– 802.11b 1Mbps

Ambient Temperature: 22.6°C Liquid Temperature: 22.0°C									
Frequency		Test Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
MHz	Ch.								
Hotspot/Body Worn Test Data (10mm)									
2437	6	802.11 b	Front	/	16.43	17	0.067	**0.08**	0.06
2437	6	802.11 b	Rear	/	16.43	17	0.120	**0.14**	0.02
2437	6	802.11 b	Left	/	16.43	17	0.012	**0.01**	-0.07
2437	6	802.11 b	Right	/	16.43	17	0.031	**0.04**	0.02
2437	6	802.11 b	Top	/	16.43	17	0.031	**0.04**	0.14
2437	6	802.11 b	Rear	**Fig.22** /EUT2	16.43	17	**0.124**	**0.14**	0.02
2437	6	802.11 b	Rear	EUT3	16.43	17	0.115	**0.13**	0.04

Note1:For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

According to the KDB248227 D01, The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. A maximum transmission duty factor of 100% is achievable for WLAN in this project and the scaled reported SAR is presented as below.

Table 14.25: SAR Values (WLAN - Body) – 802.11b 1Mbps (Scaled Reported SAR)

Ambient Temperature: 22.6°C Liquid Temperature: 22.0°C						
Frequency		Test Position	Actual duty factor	maximum duty factor	Reported SAR (1g)(W/kg)	Scaled reported SAR (1g)(W/kg)
MHz	Ch.					
2437	6	Rear	100%	100%	0.14	**0.14**

SAR is not required for OFDM because the 802.11b adjusted SAR ≤ 1.2 W/kg.

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; steps 2) 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 ≥ 1.45 W/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.

Table 15.1: SAR Measurement Variability for Body – WCDMA 1700

Frequency		Test Position	Original	1st Repeated	Ratio	2nd Repeated
MHz	Ch.		SAR (W/kg)	SAR (W/kg)		SAR (W/kg)
1712.4	1312	Rear	1.15	1.11	1.04	/

Table 15.2: SAR Measurement Variability for Body – LTE-Band 4

Frequency		Test Position	Original	1st Repeated	Ratio	2nd Repeated
MHz	Ch.		SAR (W/kg)	SAR (W/kg)		SAR (W/kg)
1720	20050	Rear	1.09	1.07	1.02	/

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	12	N	2	1	1	6.0	6.0	∞
2	Isotropy	B	7.4	R	$\sqrt{3}$	1	1	4.3	4.3	∞
3	Boundary effect	B	1.1	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	1.0	N	1	1	1	1.0	1.0	∞
7	Response time	B	0.0	R	$\sqrt{3}$	1	1	0.0	0.0	∞
8	Integration time	B	1.7	R	$\sqrt{3}$	1	1	1.0	1.0	∞
9	RF ambient conditions-noise	B	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
10	RF ambient conditions-reflection	B	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
11	Probe positioned mech. restrictions	B	0.35	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	5
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	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
18	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
19	Liquid conductivity (meas.)	A	1.3	N	1	0.64	0.43	0.83	0.56	9
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	0.96	0.78	9
Combined standard uncertainty		$u_c' = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$						10.4	10.3	95.5
Expanded uncertainty (Confidence interval of 95 %)		$u_e = 2u_c$						20.8	20.6	

16.2 Measurement Uncertainty for Fast 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	12	N	2	1	1	6.0	6.0	∞
2	Isotropy	B	7.4	R	$\sqrt{3}$	1	1	4.3	4.3	∞
3	Boundary effect	B	1.1	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	1.0	N	1	1	1	1.0	1.0	∞
7	Response time	B	0.0	R	$\sqrt{3}$	1	1	0.0	0.0	∞
8	Integration time	B	1.7	R	$\sqrt{3}$	1	1	1.0	1.0	∞
9	RF ambient conditions-noise	B	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
10	RF ambient conditions-reflection	B	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
11	Probe positioned mech. Restrictions	B	0.35	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	∞
14	Fast SAR z-Approximation	B	7.0	R	$\sqrt{3}$	1	1	4.0	4.0	∞
Test sample related										
15	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	5
16	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
17	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
18	Phantom uncertainty	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
19	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
20	Liquid conductivity (meas.)	A	1.3	N	1	0.64	0.43	0.83	0.56	43
21	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
22	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	0.96	0.78	521
Combined standard uncertainty		$u_c^{'} = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$						11.1	11.0	257
Expanded uncertainty (Confidence interval of 95 %)		$u_e = 2u_c$						22.2	22.0	