Prüfbericht-Nr.: *Test Report No.:*	**50064681 006**	**Auftrags-Nr.:** *Order No.:* 164074884	**Seite 1 von 51** *Page 1 of 51*
Kunden-Referenz-Nr.: *Client Reference No.:*	N/A	**Auftragsdatum:** *Order date:*	26.09.2016
Auftraggeber: *Client:*	**BBB Inc.** 28, Yatap-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, South Korea		
Prüfgegenstand: *Test item:*	Mobile Phone		
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	EZ-100 (elemark™, mobihealth)		
Auftrags-Inhalt: *Order content:*	FCC Certification		
Prüfgrundlage: *Test specification:*	CFR Title 47 Part 2 Section 2.1093 IEEE 1528-2013 KDB 865664 D01 v01r04 KDB 24827 D01 v02r02 KDB 941225 D01 v03r01 KDB 941225 D06 v02r01	ANSI C95.1-1992 KDB 447498 D01 v06 KDB 865664 D02 v01r02 KDB 648474 D04 v01r03 KDB 941225 D05 v02r05	
Wareneingangsdatum: *Date of receipt:*	20.11.2016	Please refer to photo documents	
Prüfmuster-Nr.: *Test sample No.:*	STR16098108H		
Prüfzeitraum: *Testing period:*	20.11.2016 – 01.12.2016		
Ort der Prüfung: *Place of testing:*	Shenzhen SEM.Test Technology Co., Ltd.		
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd.		
Prüfergebnis*: *Test result*:*	PASS		

geprüft von / *tested by*:

Lin Lin

29.12.2016	Lin Lin / Project Manager	
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

kontrolliert von / *reviewed by*:

29.12.2016	Sam Lin / Technical Certifier	
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / *Other*:

FCC ID: 2AKGP-EZ100

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery:* Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Table of Contents

1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following Appendix:
Appendix A: System performance verification
Appendix B: Highest SAR Measurement results
Appendix C: Test Setup Photos
Appendix D: Calibration Certificate

2. Test Sites

2.1 Test Facilities

Test Site: Shenzhen SEM.Test Technology Co., Ltd.
Address: 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, China

FCC Registration No.: 934118

Note: The tests at the test site have been conducted under the supervision of a TÜV engineer.

2.2 List of Test and Measurement Instruments

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
E-Field Probe	SATIMO	SSE5	SN 09/13 EP168	2016-06-01	2017-05-31
835MHz Dipole	SATIMO	SID835	SN 47/12 DIP 0G835-204	2016-03-20	2017-03-19
1800MHz Dipole	SATIMO	SID1800	SN 47/12 DIP 1G800-206	2016-03-20	2017-03-19
1900MHz Dipole	SATIMO	SID1900	SN 47/12 DIP 1G900-207	2016-03-20	2017-03-19
2450MHz Dipole	SATIMO	SID2450	SN 13/15 DIP 2G450-364	2016-03-20	2017-03-19
2600MHz Dipole	SATIMO	SID2600	SN 13/15 DIP 2G600-365	2016-03-20	2017-03-19
Dielectric Probe	SATIMO	SCLMP	SN 47/12 OCPG49	2016-03-20	2017-03-19
SAM Phantom	SATIMO	SAM	SN/ 47/12 SAM95	N/A	N/A
Multi Meter	Keithley	Keithley 2000	4006367	2016-06-04	2017-06-03
Signal Generator	Rohde & Schwarz	SMR20	100047	2016-06-04	2017-06-03
GSM Tester	Rohde & Schwarz	CMU200	104036	2016-06-04	2017-06-03
GSM Tester	Rohde & Schwarz	CMU500	148650	2016-06-04	2017-06-03
Network Analyzer	HP	8753C	2901A00831	2016-06-04	2017-06-03
Directional Couplers	Agilent	778D	20160	2016-06-04	2017-06-03

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a Mobile Phone which supports WiFi, Bluetooth, GSM, WCDMA, LTE and GPS functions.

For details refer to user manual and circuit diagram.

3.2 Product Technical Details

General Description of EUT	
Product Name:	Mobile Phone
Brand Name:	elemark™/mobihealth
Model No.:	EZ-100
Rated Voltage:	DC 3.8V
Battery Capacity:	3000mAh
Software Version:	I3501_65u_l1_20160928175345
Hardware Version:	I3501-MB-V2
Type of Product	Protable Device
GSM	
Support Networks:	GSM, GPRS, EDGE
Support Bands:	GSM850, PCS1900
Frequency Range:	GSM850: Tx: 824-849MHz, Rx: 869-894MHz
	DCS1900: Tx: 1850-1910MHz, Rx: 1930-1990MHz
Modulation Type:	GMSK, 8PSK
Channel Spacing:	200KHz
State the minimum channel separation:	200KHz
Antenna Type:	Integral Antenna
Antenna Gain:	GSM850: 1.55dBi, DCS1900: 2.51dBi
GPRS/EDGE Class:	Class 12
Device Class:	B
WCDMA	
Support Networks:	WCDMA, HSDPA, HSUPA
Category:	HSDPA UE Category:4 HSUPA UE Category:5
Support Bands:	WCDMA Band 2, WCDMA Band 5
Frequency Range:	WCDMA Band 2: Tx: 1850-1910MHz, Rx: 1930-1990MHz
	WCDMA Band 5: Tx: 824-849MHz, Rx: 869-894MHz
Modulation Type:	BPSK, QPSK, 16QAM
Channel Spacing:	200KHz
State the minimum channel separation:	5MHz
Type of Antenna:	Integral Antenna
Antenna Gain:	WCDMA Band 2: 2.49dBi, WCDMA Band 5: 1.51dBi
LTE	
Support Networks:	LTE
Category:	5
Support Bands:	FDD-LTE Band 4, 7
Frequency Range:	FDD-LTE Band 4: Tx: 1710-1755MHz, Rx: 2110-2155MHz
	FDD-LTE Band 7: Tx: 2500-2570MHz, Rx: 2620-2690MHz
Operation Bandwidth:	FDD-LTE Band 4: 1.4/3/5/10/15/20MHz FDD-LTE Band 7: 5/10/15/20MHz

Modulation Type:	QPSK, 16QAM
Antenna Type:	Internal Antenna
Antenna Gain:	FDD-LTE Band 4: 1.90dBi FDD-LTE Band 7: 2.76dBi
Bluetooth	
Bluetooth Version:	V4.0 dual mode
Frequency Range:	2402-2480MHz
Type of Modulation:	GFSK, Pi/4 DQPSK, 8DPSK
Data Rate:	1Mbps, 2Mbps, 3Mbps
Quantity of Channels	79/40
Channel Separation:	1MHz, 2MHz
Type of Antenna:	Internal Antenna
Antenna Gain:	2.51dBi
WiFi	
Support Standards:	802.11b/g/n-HT20/n-HT40
Frequency Range:	2412-2462MHz for 802.11b/g/n(HT20) 2422-2452MHz for 802.11b/g/n(HT40)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 150Mbps
Quantity of Channels	11 for 802.11b/g/n(HT20) 7 for 802.11b/g/n(HT40)
Channel Separation:	5MHz
Type of Antenna:	Internal Antenna
Antenna Gain:	2.51dBi
GPS	
Frequency Range:	1575.42MHz

3.3 Submitted Documents

3.3.1 Test specification(s)

ANSI C95.1-1992 IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

IEEE 1528-2013 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

KDB447498 D01: General RF Exposure Guidance v06: RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES FOR MOBILE AND PORTABLE DEVICES.

KDB865664 D01SAR measurement 100 MHz to 6 GHz v01r04: SAR MEASUREMENT REQUIREMENTS FOR 100 MHz TO 6 GHz.

KDB865664 D02 RF Exposure Reporting v01r02: RF EXPOSURE COMPLIANCE REPORTING AND DOCUMENTATION CONSIDERATIONS.

KDB248227 D01 802.11 Wi-Fi SAR v02r02: SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS.

KDB648474 D04 Handset SAR v01r03: SAR EVALUATION CONSIDERATIONS FOR WIRELESS HANDSETS.

KDB941225 D01 SAR test for 3G devices v03r01: 3G SAR MEAUREMENT PROCEDURES.

KDB941225 D05 SAR for LTE Devices v02r05: SAR EVALUATION CONSIDERATIONS FOR LTE

DEVICES.

KDB941225 D06 Hotspot Mode SAR v02r01: SAR EVALUATION PROCEDURES FOR PORTABLE DEVICES WITH WIRELESS ROUTER CAPABILITIES.

3.3.2 RF exposure limits

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.

3.4 Summary of Measurement Results

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

Frequency Band	Head SAR	Body-worn (10mm Gap)	Hotspot (10mm Gap)	SAR_{1g} Limit (W/kg)
	Maximum SAR_{1g} (W/kg)	Maximum SAR_{1g} (W/kg)	Maximum SAR_{1g} (W/kg)	
GSM	**0.330**	0.316	0.545	1.6
WCDMA	0.157	0.248	0.346	1.6
LTE	0.178	**0.515**	**0.645**	1.6
WLAN	0.318	0.108	0.108	1.6
Simultaneous Transmission	0.642	0.609	**0.645**	1.6

Remark:
The highest reported SAR values for head, body-worn accessory, hotspot, and simultaneous transmission conditions are ***0.330W/kg, 0.515W/kg, 0.645W/kg, and 0.645W/kg*** *respectively.*

The device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR Part 2.1093 and ANSI/IEEE C95.1, and had been tested in accordance with the measurement methods and procedure specified in IEEE 1528-2013, KDB 865664 D01 v01r04 and KDB 865664 D02 v01r02.

4. Specific Absorption Rate (SAR)

4.1 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 techiques 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.

4.2 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:

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

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

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

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

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

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

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

5. SAR Measurement System Configuration

5.1 SAR Measurement System

Comosar is a system that is able to determine the SAR distribution inside a phantom of human being according to different standards. The Comosar system consists of the following items:
- Main computer to control all the system
- 6 axis robot
- Data acquisition system
- Miniature E-field probe
- Phone holder
- Head simulating tissue

The following figure shows the system.

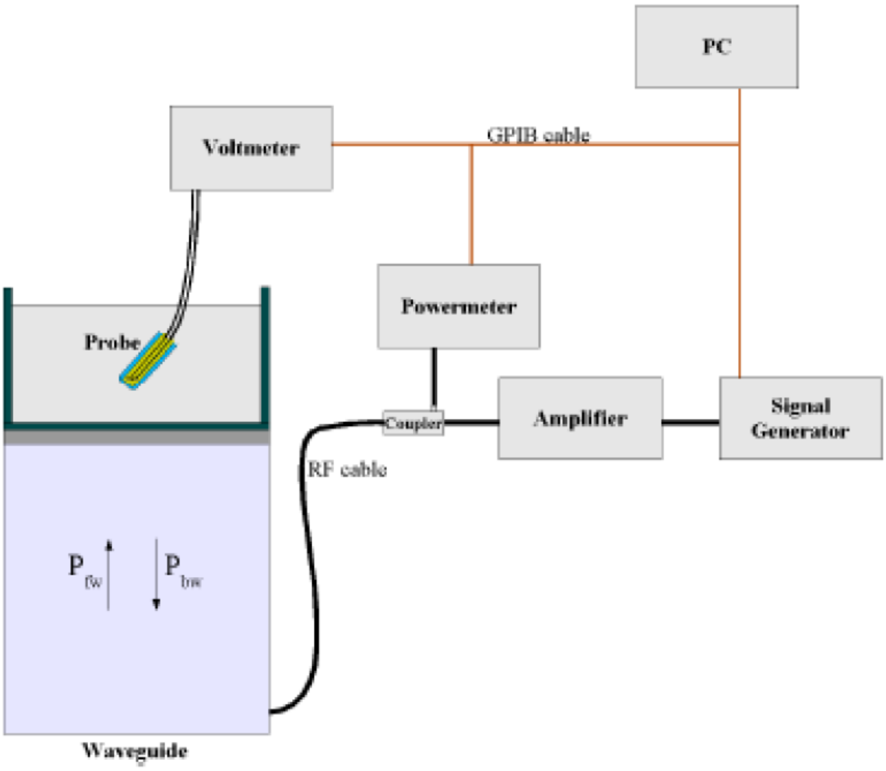
The EUT under test operating at the maximum power level is placed in the phone holder, under the phantom, which is filled with head simulating liquid. The E-Field probe measures the electric field inside the phantom. The OpenSAR software computes the results to give a SAR value in a 1g or 10g mass.

5.2 Probe

For the measurements the Specific Dosimetric E-Field Probe SSE5 SN 09/13 EP168 with following specifications is used
- Dynamic range: 0.01-100 W/kg
- Probe Length: 330 mm
- Length of Individual Dipoles: 4.5 mm
- Maximum external diameter: 8 mm
- Probe Tip External Diameter: 5 mm
- Distance between dipoles / probe extremity: 2.7mm
- Probe linearity: ＜0.25 dB
- Axial Isotropy: ＜0.25 dB
- Spherical Isotropy: ＜0.50 dB
- Calibration range: 700 to 3000MHz for head & body simulating liquid.

Angle between probe axis (evaluation axis) and suface normal line: less than 30°

Probe calibration is realized, in compliance with EN 62209-1 and IEEE 1528 STD, with CALISAR, Antennessa proprietary calibration system. The calibration is performed with the EN 62209-1 annexe technique using reference guide at the five frequencies.



$$SAR = \frac{4\left(P_{fw} - P_{bw}\right)}{ab\delta} \cos^2\left(\pi \frac{y}{a}\right) e^{(2z/\delta)}$$

Where :
Pfw = Forward Power
Pbw = Backward Power
a and b = Waveguide dimensions
l = Skin depth

Keithley configuration:
Rate = Medium; Filter = ON; RDGS = 10; Filter type = Moving Average; Range auto after each calibration, a SAR measurement is performed on a validation dipole and compared with a NPL calibrated probe, to verify it.

The calibration factors, CF(N), for the 3 sensors corresponding to dipole 1, dipole 2 and dipole 3 are:
CF(N)=SAR(N)/Vlin(N) (N=1,2,3)

The linearised output voltage Vlin(N) is obtained from the displayed output voltage V(N) using
Vlin(N)=V(N)*(1+V(N)/DCP(N)) (N=1,2,3)

Where DCP is the diode compression point in mV.

5.3 Probe Calibration Process

Dosimetric Assessment Procedure

Each E-Probe/Probe Amplifier combination has unique calibration parameters. SATIMO Probe calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm2) using with CALISAR, Antenna proprietary calibration system.

Free Space Assessment Procedure
The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and in a waveguide or other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1mW/cm2.

Temperature Assessment Procedure
E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated head tissue. The E-field in the medium correlates with the temperature rise in the dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where:
Δt = exposure time (30 seconds),
C = heat capacity of tissue (brain or muscle),
ΔT = temperature increase due to RF exposure.

SAR is proportional to ΔT/Δt, the initial rate of tissue heating, before thermal diffusion takes place. The electric field in the simulated tissue can be used to estimate SAR by equating the thermally derived SAR to that with the E- field component.

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

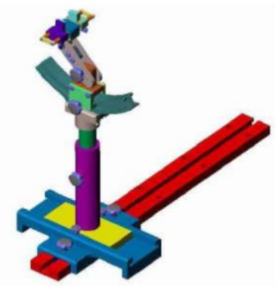
Where:
σ = simulated tissue conductivity,
ρ = Tissue density (1.25 g/cm3 for brain tissue)

5.4 Phantom

For the measurements the Specific Anthropomorphic Mannequin (SAM) defined by the IEEE SCC-34/SC2 group is used. The phantom is a polyurethane shell integrated in a wooden table. The thickness of the phantom amounts to 2mm +/- 0.2mm. It enables the dosimetric evaluation of left and right phone usage and includes an additional flat phantom part for the simplified performance check. The phantom set-up includes a cover, which prevents the evaporation of the liquid.

5.5 Device Holder

The positioning system allows obtaining cheek and tilting position with a very good accuracy. In compliance with CENELEC, the tilt angle uncertainty is lower than 1°.

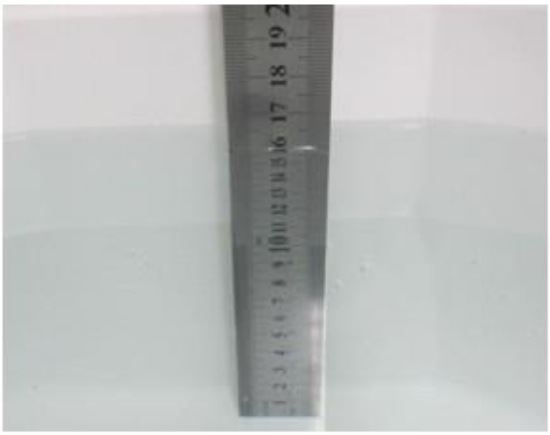


System Material	Permittivity	Loss Tangent
Delrin	3.7	0.005

6. Tissue Simulating Liquids

6.1 Composition of Tissue Simulating Liquid

For the measurement of the field distribution inside the SAM phantom with SMTIMO, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. Please see the following photos for the liquid height.



Liquid Height for Head SAR

Liquid Height for Body SAR

The Composition of Tissue Simulating Liquid

Frequency (MHz)	Water (%)	Salt (%)	Sugar (%)	HEC (%)	Preventol (%)	DGBE (%)
Head						
835	40.3	1.4	57.9	0.2	0.2	0.00
1800	55.2	0.3	0	0	0	44.5
1900	55.2	0.3	0	0	0	44.5
2450	55.0	0.1	0	0	0	44.9
2600	54.9	0.1	0	0	0	45.0
Body						
835	50.8	0.9	48.2	0	0.1	0.00
1800	70.2	0.4	0	0	0	29.4
1900	70.2	0.4	0	0	0	29.4
2450	68.6	0.1	0	0	0	31.3
2600	68.2	0.1	0	0	0	31.7

6.2 Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

Target Frequency (MHz)	Head		Body	
	Conductivity (σ)	Permittivity (ε_r)	Conductivity (σ)	Permittivity (ε_r)

150	0.76	52.3	0.80	61.9
300	0.87	45.3	0.92	58.2
450	0.87	43.5	0.94	56.7
750	0.89	41.9	0.96	55.5
835	0.90	41.5	0.97	55.2
900	0.97	41.5	1.05	55.0
915	0.98	41.5	1.06	55.0
1450	1.20	40.5	1.30	54.0
1610	1.29	40.3	1.40	53.8
1800-2000	1.40	40.0	1.52	53.3
2450	1.80	39.2	1.95	52.7
3000	2.40	38.5	2.73	52.0
5800	5.27	35.3	6.00	48.2

6.3 Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using COMOSAR Dielectric Probe Kit and an Agilent Network Analyzer.

Calibration Result for Dielectric Parameters of Tissue Simulating Liquid

Head Tissue Simulating Liquid									
Freq. MHz.	Temp. (℃)	Conductivity			Permittivity			Limit (%)	Date
		Reading (σ)	Target (σ)	Delta (%)	Reading (εr)	Target (εr)	Delta (%)		
835	21.2	0.87	0.90	-3.33	41.11	41.50	-0.94	±5	2016-11-21
1800	21.3	1.35	1.40	-3.57	40.62	40.00	1.55	±5	2016-11-21
1900	21.3	1.38	1.40	-1.43	38.56	40.00	-3.60	±5	2016-11-21
2450	21.3	1.74	1.80	-3.33	38.15	39.20	-2.68	±5	2016-11-21
2600	21.3	1.93	1.96	-1.53	38.63	39.0	-0.95	±5	2016-11-21

Body Tissue Simulating Liquid									
Freq. MHz.	Temp. (℃)	Conductivity			Permittivity			Limit (%)	Date
		Reading (σ)	Target (σ)	Delta (%)	Reading (εr)	Target (εr)	Delta (%)		
835	21.2	0.95	0.97	-2.06	54.85	55.20	-0.63	±5	2016-11-21
1800	21.3	1.56	1.52	2.63	51.92	53.30	-2.59	±5	2016-11-21
1900	21.3	1.50	1.52	-1.32	52.42	53.30	-1.65	±5	2016-11-21
2450	21.3	1.91	1.95	-2.05	52.01	52.70	-1.31	±5	2016-11-21
2600	21.3	2.12	2.16	-1.85	52.24	52.50	-0.50	±5	2016-11-21

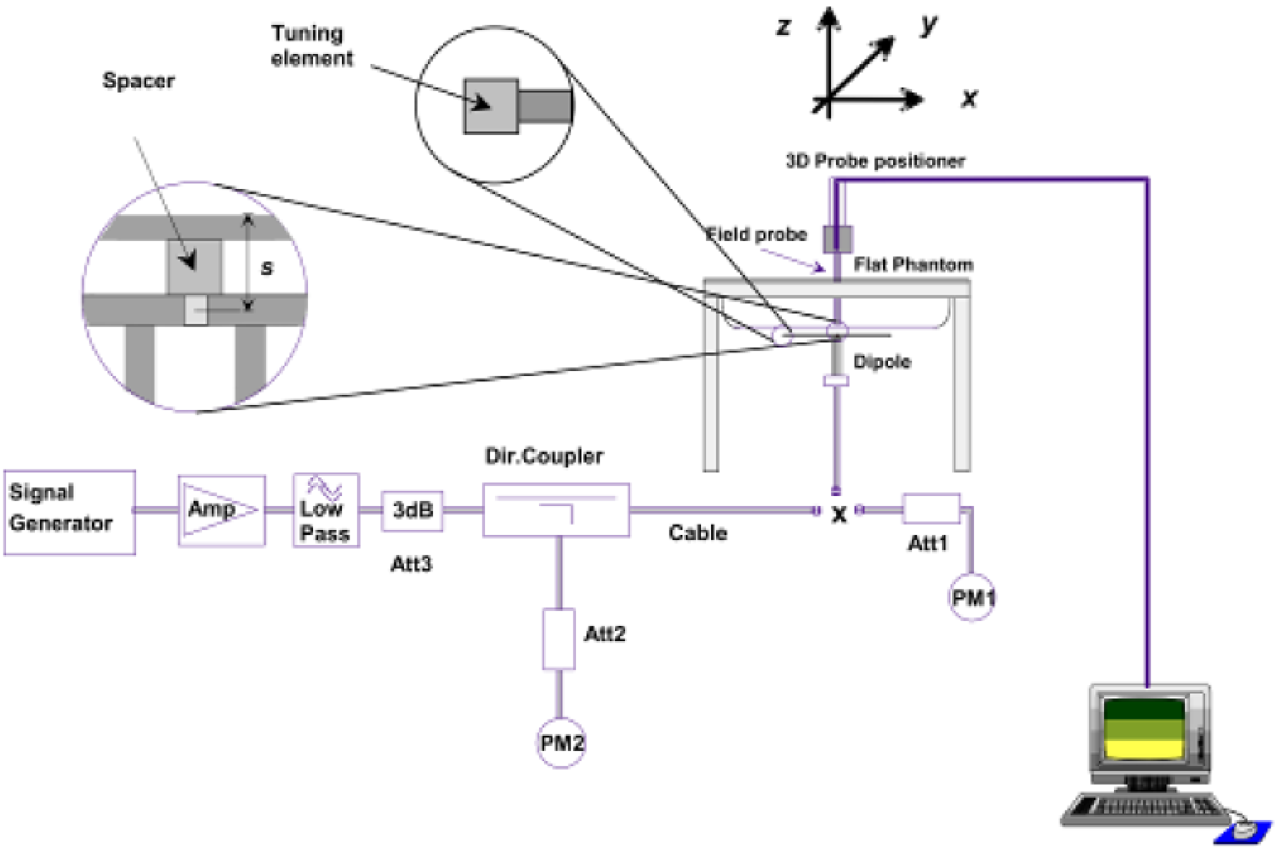
7. SAR Measurement Evaluation

7.1 Purpose of System Performance Check

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

7.2 System Setup

In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave which comes from a signal generator at frequency 835 MHz and 1900 MHz. 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.



System Verification Setup Block Diagram

Setup Photo of Dipole Antenna

The output power on dipole port must be calibrated to 24 dBm (250 mW) before dipole is connected.

7.3 Validation Results

Comparing to the original SAR value provided by SATIMO, the validation data should be within its specification of 10 %. Table 6.1 shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion.

Frequency	Targeted SAR_{1g}	Measured SAR_{1g}	Normalized SAR_{1g}	Tolerance
MHz	(W/kg)	(W/kg)	(W/kg)	(%)
Head (Date: 2016-11-21)				
835	9.67	2.41	9.64	-0.31
1800	38.51	9.76	39.04	1.38
1900	39.58	9.91	39.64	0.15
2450	53.69	13.45	53.8	0.20
2600	55.13	13.67	54.68	-0.82
Body (Date: 2016-11-21)				
835	9.38	2.35	9.4	0.21
1800	38.31	9.84	39.36	2.74
1900	39.10	9.78	39.12	0.05
2450	50.41	12.59	50.36	-0.10
2600	53.89	13.48	53.92	0.06

Validation Results of Targeted and Measurement SAR

8. EUT Testing Position

The DUT is tested using a Wireless communications tester as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted peak power.

8.1 Test Positions Configuration

8.1.1 General considerations

(a) The vertical centerline passes through two points on the front side of the handset - the midpoint of the width w_t of the handset at the level of the acoustic output, and the midpoint of the width w_b of the bottom of the handset.

(b) The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.

(c) The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

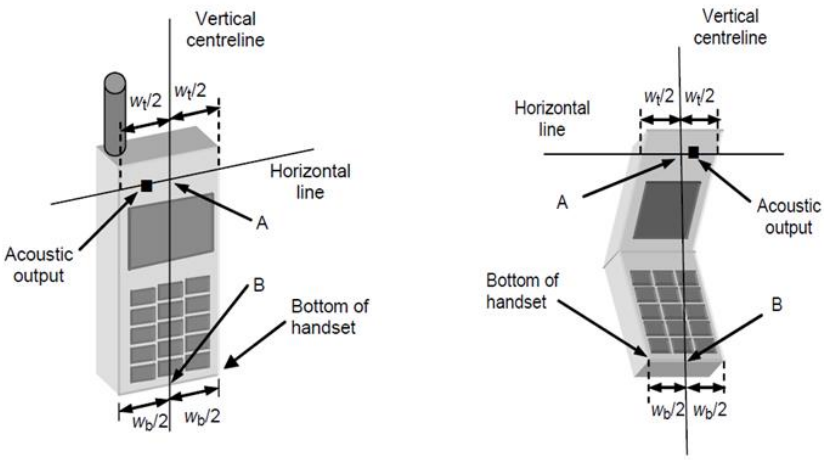


Illustration for Hand Vertical Center & Horizontal Line Reference Points

Note
wt Width of the handset at the level of the acoustic output
wb Width of the bottom of the handset
A Midpoint of the width wt of the handset at the level of the acoustic output
B Midpoint of the width wb of the bottom of the handset

8.1.2 Cheek Position

(a) To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.

(b) To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost.

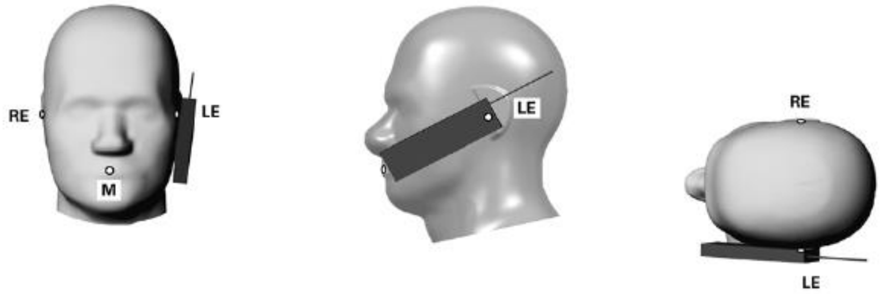


Illustration for Cheek Position

8.1.3 Tilted Position

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

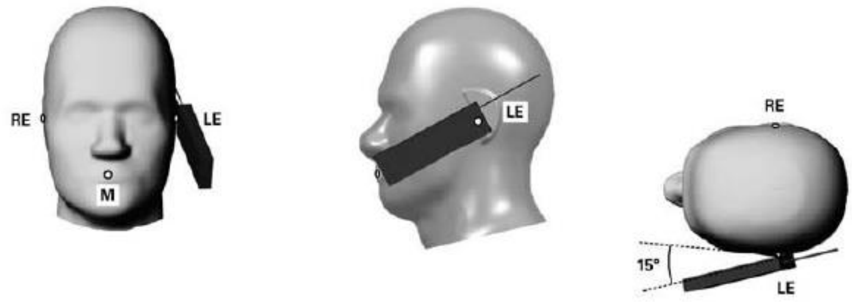


Illustration for Tilted Position

8.1.4 Body Worn Position

(a) To position the device parallel to the phantom surface with either keypad up or down.
(b) To adjust the device parallel to the flat phantom.
(c) To adjust the distance between the device surface and the flat phantom to 10mm.

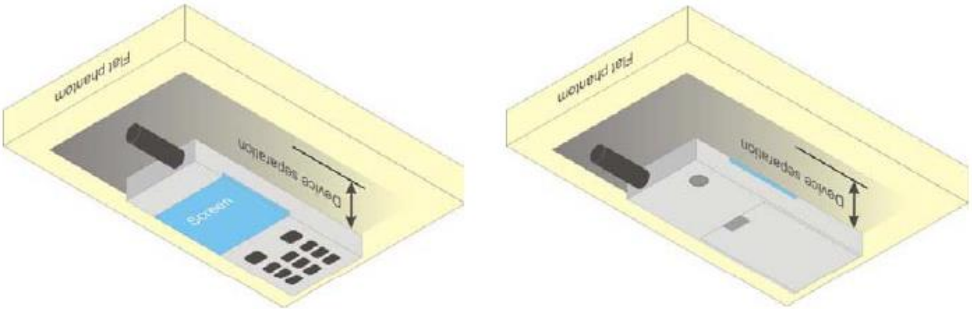


Illustration for Body Worn Position

8.2 EUT Antenna Position

Right Side **Left Side**

Bottom Side

Block Diagram for EUT Antenna Position

8.2.1 EUT Testing Position

Head/Body-worn/Hotspot mode SAR assessments are required for this device. This EUT was tested in different positions for different SAR test modes, more information as below:

Head SAR tests				
Antennas	Right Cheek	Left Cheek	Right Tilted	Left Tilted
WWAN	Yes	Yes	Yes	Yes
WLAN	Yes	Yes	Yes	Yes

Body-worn SAR tests		
Antennas	Front	Back
WWAN	Yes	Yes
WLAN	Yes	Yes

Hotspot SAR tests, Test distance: 10mm						
Antennas	Front	Back	Right Side	Left Side	Top Side	Bottom Side
WWAN	Yes	Yes	No	Yes	No	Yes
WLAN	Yes	Yes	No	No	Yes	No

Remark:
1. According to KDB 941225 D06, when the overall device length and width are ≥ 9cmx5cm, the test separation distances is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

9. SAR Measurement Procedures

9.1 Measurement Procedures

The measurement procedures are as follows:
(a) Use base station simulator (if applicable) or engineering software to transmit RF power continuously (continuous TX) in the highest power channel.
(b) Keep EUT to radiate maximum output power or 100% factor (if applicable)
(c) Measure output power through RF cable and power meter.
(d) Set scan area, grid size and other setting on the SATIMO software.
(e) Measure SAR results for the highest power channel on each testing position.
(f) Find out the largest SAR result on these testing positions of each band
(g) Measure SAR results for other channels in worst SAR testing position if the SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps (SAR Measurement technical setting refer below table):
(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement
The following figure shows the SAR measurement parameter.

		≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface		5 mm ± 1 mm	$\frac{1}{2}\cdot\delta\cdot\ln(2)$ mm ± 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
	graded grid: $\Delta z_{Zoom}(n>1)$: between subsequent points	≤ $1.5\cdot\Delta z_{Zoom}(n-1)$ mm	
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 IEEE Std 1528-2013 for details. * When zoom scan is required and the <u>*reported*</u> SAR from the *area scan based 1-g SAR estimation* procedures of KDB Publication 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.			

9.2 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The SATIMO software includes all numerical procedures necessary to evaluate the spatial peak SAR value.
The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.
The entire evaluation of the spatial peak values is performed within the post-processing engine. The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:
(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3D field distribution to the phantom surface over the distance from sensor to surface.
(f) Calculation of the averaged SAR within masses of 1g and 10g

9.3 Area & Zoom Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan measures 5x5x7 points with step size 8, 8 and 5 mm for 300 MHz to 3 GHz, and 8x8x8 points with step size 4, 4 and 2.5 mm for 3 GHz to 6 GHz. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

9.4 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing (step-size is 4, 4 and 2.5 mm). When all volume scan were completed, the software can combine and subsequently superpose these measurement data to calculating the multiband SAR.

9.5 SAR Averaged Methods

The local SAR inside the phantom is measured using small dipole sensing elements inside a probe body. The probe tip must not be in contact with the phantom surface in order to minimize measurements errors, but the highest local SAR will occur at the surface of the phantom.

An extrapolation is using to determinate this highest local SAR values. The extrapolation is based on a fourth-order least-square polynomial fit of measured data. The local SAR value is then extrapolated from the liquid surface with a 1mm step.

The measurements have to be performed over a limited time (due to the duration of the battery) so the step of measurement is high. It could vary between 5 and 8 mm. To obtain an accurate assessment of the maximum SAR averaged over 10g and 1 g requires a very fine resolution in the three dimensional scanned data array.

9.6 Power Drift Monitoring

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

10. Measurement Results

10.1 Conducted Power

GSM - Burst Average Power (dBm)						
Band	GSM850			PCS1900		
Channel	128	190	251	512	661	810
Frequency (MHz)	824.2	836.6	848.8	1850.2	1880	1909.8
GSM	32.84	33.09	32.99	30.04	29.08	28.94
GPRS (1 slot)	31.88	32.18	32.11	30.1	28.88	28.69
GPRS (2 slots)	31.19	31.44	31.32	29.23	28.13	27.95
GPRS (3 slots)	29.45	29.6	29.38	27.24	26.31	26.26
GPRS (4 slots)	29.42	28.51	28.22	26.08	25.18	25.33
EDGE (1 slot)	27.13	26.99	26.76	24.34	24	23.39
EDGE (2 slots)	26.11	25.88	25.67	24.25	23.03	22.37
EDGE (3 slots)	24.12	23.95	23.67	23.29	21.76	21.11
EDGE (4 slots)	23.01	22.76	22.41	22.13	20.6	19.98

GSM - Source-Based Time-Average Power (dBm)						
Band	GSM850			PCS1900		
Channel	128	190	251	512	661	810
Frequency (MHz)	824.2	836.6	848.8	1850.2	1880	1909.8
GSM	23.84	24.09	23.99	21.04	20.08	19.94
GPRS (1 slot)	22.88	23.18	23.11	21.10	19.88	19.69
GPRS (2 slots)	25.19	25.44	25.32	23.23	22.13	21.95
GPRS (3 slots)	25.20	25.35	25.13	22.99	22.06	22.01
GPRS (4 slots)	26.42	25.51	25.22	23.08	22.18	22.33
EDGE (1 slot)	18.13	17.99	17.76	15.34	15.00	14.39
EDGE (2 slots)	20.11	19.88	19.67	18.25	17.03	16.37
EDGE (3 slots)	19.87	19.70	19.42	19.04	17.51	16.86
EDGE (4 slots)	20.01	19.76	19.41	19.13	17.60	16.98
Note: The source-based time-averaged power is linearly scaled the maximum burst averaged power based on time slots. The calculated method are shown as below: Source based time-average power = Burst averaged power - Duty cycle factor in dB Duty cycle factor = 9 dB for 1 Tx slot, 6 dB for 2 Tx slots, 4.25 dB for 3 Tx slots, 3 dB for 4 Tx slots						

Remark:
1. For Head SAR testing, GSM should be evaluated, therefore the EUT was set in GSM for GSM850 and GSM1900 due to its highest source-based time-average power.
2. For Body SAR testing, GPRS should be evaluated, therefore the EUT was set in GPRS (4TX slots) for GSM850 and GPRS (2TX slots) for GSM1900 due to its highest source-based time-average power.
3. Per KDB 447498 D01 v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
4. The DUT do not support DTM function.

WCDMA - Average Power (dBm)						
Band	WCDMA Band II			WCDMA Band V		
Channel	9262	9400	9538	4132	4183	4233
Frequency (MHz)	1852.4	1880.0	1907.6	826.4	836.6	846.6
RMC 12.2k	22.64	22.63	22.79	22.32	22.34	22.31
HSDPA Subtest-1	21.67	21.73	21.77	21.41	21.43	21.43
HSDPA Subtest-2	21.62	21.71	21.75	21.38	21.41	21.37
HSDPA Subtest-3	21.65	21.69	21.76	21.35	21.42	21.43
HSDPA Subtest-4	21.61	21.71	21.73	21.38	21.4	21.39
HSUPA Subtest-1	21.74	21.74	21.75	21.62	21.48	21.39
HSUPA Subtest-2	21.71	21.73	21.69	21.58	21.42	21.36
HSUPA Subtest-3	21.73	21.72	21.65	21.59	21.45	21.37
HSUPA Subtest-4	21.69	21.68	21.73	21.61	21.47	21.36
HSUPA Subtest-5	21.73	21.71	21.73	21.58	21.44	21.35

Remark:
1. For Head SAR, per KDB 941225 D01 v03, RMC 12.2kbps setting is used to evaluate SAR. If AMR 12.2kbps power is < 1/4 dB higher than RMC, SAR tests with AMR 12.2kbps can be excluded.
2. For Body SAR, per KDB 941225 D01 v03, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA subset-1 output power is < 1/4 dB higher than RMC, and SAR with RMC 12.2kbps setting is ≦1.2W/kg, HSDPA SAR evaluation can be excluded

FDD-LTE Band 4:

Channel Bandwidth: 1.4 MHz

Modulation	Channel	RB Configuration		Average Power [dBm]
		Size	Offset	
QPSK	LCH	1	0	22.91
		1	3	22.92
		1	5	22.81
		3	0	22.94
		3	2	22.88
		3	3	22.91
		6	0	21.90
	MCH	1	0	22.58
		1	3	22.70
		1	5	22.61
		3	0	22.62
		3	2	22.60
		3	3	22.61
		6	0	21.59
	HCH	1	0	23.90
		1	3	23.92
		1	5	23.81
		3	0	22.76
		3	2	22.74
		3	3	22.77
		6	0	22.86
16QAM	LCH	1	0	22.22
		1	3	22.28
		1	5	22.13
		3	0	21.89
		3	2	21.84
		3	3	21.88
		6	0	20.82
	MCH	1	0	21.83
		1	3	22.00
		1	5	21.87
		3	0	21.66
		3	2	21.65
		3	3	21.70
		6	0	20.71
	HCH	1	0	22.76
		1	3	22.89
		1	5	22.79
		3	0	22.73
		3	2	22.70
		3	3	22.71
		6	0	21.68

Channel Bandwidth: 3 MHz

Modulation	Channel	RB Configuration		Average Power [dBm]
		Size	Offset	
QPSK	LCH	1	0	22.79
		1	7	22.79
		1	14	22.59
		8	0	21.91

		8	4	21.84
		8	7	21.78
		15	0	21.81
	MCH	1	0	22.42
		1	7	22.58
		1	14	22.52
		8	0	21.55
		8	4	21.59
		8	7	21.61
		15	0	21.57
	HCH	1	0	23.81
		1	7	23.86
		1	14	23.72
		8	0	22.87
		8	4	22.87
		8	7	22.83
		15	0	22.73
16QAM	LCH	1	0	22.03
		1	7	22.03
		1	14	21.80
		8	0	20.92
		8	4	20.88
		8	7	20.80
		15	0	20.77
	MCH	1	0	21.72
		1	7	21.86
		1	14	21.78
		8	0	20.62
		8	4	20.65
		8	7	20.64
		15	0	20.58
	HCH	1	0	22.82
		1	7	22.96
		1	14	22.89
		8	0	21.73
		8	4	21.74
		8	7	21.75
		15	0	21.70

Channel Bandwidth: 5 MHz

Modulation	Channel	RB Configuration		Average Power [dBm]
		Size	Offset	
QPSK	LCH	1	0	22.94
		1	12	22.83
		1	24	22.63
		12	0	21.89
		12	6	21.80
		12	13	21.73
		25	0	21.76
	MCH	1	0	22.54
		1	12	22.67
		1	24	22.71
		12	0	21.61
		12	6	21.65
		12	13	21.71

		25	0	21.61
	HCH	1	0	23.63
		1	12	24.03
		1	24	23.93
		12	0	21.62
		12	6	21.81
		12	13	22.13
		25	0	22.72
16QAM	LCH	1	0	22.25
		1	12	22.14
		1	24	21.94
		12	0	21.01
		12	6	20.91
		12	13	20.84
		25	0	20.78
	MCH	1	0	21.93
		1	12	22.06
		1	24	22.06
		12	0	20.76
		12	6	20.80
		12	13	20.88
		25	0	20.65
	HCH	1	0	22.60
		1	12	22.69
		1	24	22.67
		12	0	21.71
		12	6	21.72
		12	13	21.76
		25	0	21.69

Channel Bandwidth: 10 MHz

Modulation	Channel	RB Configuration		Average Power [dBm]
		Size	Offset	
QPSK	LCH	1	0	22.87
		1	24	22.55
		1	49	22.42
		25	0	21.73
		25	12	21.57
		25	25	21.51
		50	0	21.63
	MCH	1	0	22.46
		1	24	22.56
		1	49	22.76
		25	0	21.54
		25	12	21.61
		25	25	21.72
		50	0	21.63
	HCH	1	0	23.88
		1	24	23.82
		1	49	23.78
		25	0	22.61
		25	12	22.72
		25	25	22.72
		50	0	22.64
16QAM	LCH	1	0	22.07

		1	24	21.77
		1	49	21.67
		25	0	20.73
		25	12	20.59
		25	25	20.52
		50	0	20.64
	MCH	1	0	21.75
		1	24	21.84
		1	49	21.93
		25	0	20.52
		25	12	20.63
		25	25	20.72
		50	0	20.66
	HCH	1	0	22.57
		1	24	22.80
		1	49	22.96
		25	0	21.46
		25	12	21.60
		25	25	21.69
		50	0	21.60

Channel Bandwidth: 15 MHz

Modulation	Channel	RB Configuration		Average Power [dBm]
		Size	Offset	
QPSK	LCH	1	0	22.87
		1	37	22.57
		1	74	22.44
		37	0	21.82
		37	18	21.65
		37	38	21.54
		75	0	21.68
	MCH	1	0	22.45
		1	37	22.66
		1	74	22.93
		37	0	21.72
		37	18	21.69
		37	38	21.72
		75	0	21.73
	HCH	1	0	22.76
		1	37	23.30
		1	74	23.57
		37	0	22.06
		37	18	22.32
		37	38	22.51
		75	0	22.23
16QAM	LCH	1	0	22.08
		1	37	21.80
		1	74	21.72
		37	0	20.73
		37	18	20.59
		37	38	20.50
		75	0	20.64
	MCH	1	0	21.97
		1	37	21.94
		1	74	21.73

		37	0	20.70
		37	18	20.67
		37	38	20.69
		75	0	20.70
	HCH	1	0	21.79
		1	37	22.20
		1	74	22.57
		37	0	20.89
		37	18	21.11
		37	38	21.33
		75	0	21.07

Channel Bandwidth: 20 MHz

Modulation	Channel	RB Configuration		Average Power [dBm]
		Size	Offset	
QPSK	LCH	1	0	23.11
		1	49	22.84
		1	99	22.85
		50	0	21.89
		50	25	21.78
		50	50	21.76
		100	0	21.84
	MCH	1	0	22.82
		1	49	22.74
		1	99	22.84
		50	0	21.71
		50	25	21.65
		50	50	21.65
		100	0	21.68
	HCH	1	0	22.70
		1	49	23.12
		1	99	24.04
		50	0	23.71
		50	25	23.70
		50	50	23.71
		100	0	21.87
16QAM	LCH	1	0	22.22
		1	49	21.98
		1	99	21.99
		50	0	20.89
		50	25	20.78
		50	50	20.74
		100	0	20.84
	MCH	1	0	21.98
		1	49	21.89
		1	99	21.82
		50	0	20.67
		50	25	20.65
		50	50	20.62
		100	0	20.64
	HCH	1	0	21.97
		1	49	22.06
		1	99	22.68
		50	0	20.63
		50	25	20.78

		50	50	21.09
		100	0	20.79

FDD-LTE Band 7:

Channel Bandwidth: 5 MHz

Modulation	Channel	RB Configuration		Average Power [dBm]
		Size	Offset	
QPSK	LCH	1	0	22.53
		1	12	22.65
		1	24	22.65
		12	0	21.66
		12	6	21.70
		12	13	21.75
		25	0	21.65
	MCH	1	0	22.98
		1	12	23.03
		1	24	22.91
		12	0	21.97
		12	6	21.91
		12	13	21.92
		25	0	21.90
	HCH	1	0	23.17
		1	12	22.89
		1	24	22.72
		12	0	22.25
		12	6	22.29
		12	13	22.18
		25	0	22.27
16QAM	LCH	1	0	21.81
		1	12	21.96
		1	24	21.99
		12	0	20.74
		12	6	20.78
		12	13	20.84
		25	0	20.64
	MCH	1	0	21.90
		1	12	21.89
		1	24	21.79
		12	0	20.96
		12	6	20.92
		12	13	20.91
		25	0	20.88
	HCH	1	0	22.11
		1	12	22.11
		1	24	22.01
		12	0	21.24
		12	6	21.25
		12	13	21.27
		25	0	21.25

Channel Bandwidth: 10 MHz

Modulation	Channel	RB Configuration		Average Power [dBm]
		Size	Offset	
QPSK	LCH	1	0	22.61

		1	24	22.73
		1	49	22.90
		25	0	21.75
		25	12	21.83
		25	25	21.92
		50	0	21.80
	MCH	1	0	22.95
		1	24	22.82
		1	49	22.74
		25	0	21.96
		25	12	21.91
		25	25	21.87
		50	0	21.89
	HCH	1	0	22.41
		1	24	23.03
		1	49	22.46
		25	0	22.11
		25	12	22.14
		25	25	22.25
		50	0	22.17
16QAM	LCH	1	0	21.82
		1	24	22.00
		1	49	22.10
		25	0	20.69
		25	12	20.75
		25	25	20.84
		50	0	20.74
	MCH	1	0	22.18
		1	24	22.05
		1	49	22.00
		25	0	20.93
		25	12	20.87
		25	25	20.86
		50	0	20.85
	HCH	1	0	21.90
		1	24	22.35
		1	49	21.92
		25	0	21.09
		25	12	21.14
		25	25	21.22
		50	0	21.16

Channel Bandwidth: 15 MHz

Modulation	Channel	RB Configuration		Average Power [dBm]
		Size	Offset	
QPSK	LCH	1	0	22.63
		1	37	22.89
		1	74	22.91
		37	0	21.89
		37	18	21.99
		37	38	22.04
		75	0	21.96
	MCH	1	0	23.00
		1	37	22.87
		1	74	22.67

		37	0	22.11
		37	18	22.02
		37	38	22.00
		75	0	22.03
	HCH	1	0	22.36
		1	37	22.96
		1	74	22.82
		37	0	21.75
		37	18	22.20
		37	38	22.37
		75	0	22.22
16QAM	LCH	1	0	21.81
		1	37	22.13
		1	74	22.14
		37	0	20.82
		37	18	20.90
		37	38	20.94
		75	0	20.89
	MCH	1	0	22.22
		1	37	22.12
		1	74	21.93
		37	0	21.03
		37	18	20.94
		37	38	20.92
		75	0	20.96
	HCH	1	0	21.81
		1	37	22.29
		1	74	22.19
		37	0	20.96
		37	18	21.19
		37	38	21.33
		75	0	21.17

Channel Bandwidth: 20 MHz

Modulation	Channel	RB Configuration		Average Power [dBm]
		Size	Offset	
QPSK	LCH	1	0	22.80
		1	49	22.98
		1	99	23.19
		50	0	21.85
		50	25	21.92
		50	50	22.02
		100	0	21.90
	MCH	1	0	23.17
		1	49	22.95
		1	99	22.87
		50	0	22.01
		50	25	21.93
		50	50	21.87
		100	0	21.92
	HCH	1	0	22.58
		1	49	22.58
		1	99	22.89
		50	0	21.60
		50	25	21.95

		50	50	22.21
		100	0	22.04
16QAM	LCH	1	0	21.88
		1	49	22.14
		1	99	22.29
		50	0	20.80
		50	25	20.86
		50	50	20.94
		100	0	20.84
	MCH	1	0	22.29
		1	49	22.07
		1	99	22.00
		50	0	20.94
		50	25	20.87
		50	50	20.83
		100	0	20.90
	HCH	1	0	22.04
		1	49	22.04
		1	99	22.36
		50	0	20.82
		50	25	21.11
		50	50	21.21
		100	0	21.01

Remark:
KDB941225 D05
1. Start with the largest channel bandwidth then 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.6 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. The procedures required for 1 RB allocation in 5.2.1 are applied to measure the SAR for QPSK with 50% RB allocation.
3. 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 5.2.1 and 5.2.2 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.
4. For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in 5.2.1, 5.2.2, and 5.2.3 to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

WLAN - Maximum Average Power				
Test Mode	Data Rate	Channel	Frequency (MHz)	Average Power (dBm)
802.11b	1Mbps	CH 01	2412	13.10
		CH 06	2437	11.85
		CH 11	2462	11.91
802.11g	54Mbps	CH 01	2412	10.87
		CH 06	2437	8.93
		CH 11	2462	8.62
802.11n (20MHz)	MCS7	CH 01	2412	9.95
		CH 06	2437	8.53
		CH 11	2462	10.17
802.11n (40MHz)	MCS7	CH 03	2422	10.04
		CH 06	2437	9.05
		CH 09	2452	9.74

Remark:
1. Per KDB 248227 D01 v02r02, choose the highest output power channel to test SAR and determine further SAR exclusion.
2. SAR is not required for 802.11g/n when
a) KDB Publication 447498 D01 SAR test exclusion applies to the OFDM configuration.
b) 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.
3. Each channel should be tested at the lowest data rate, and repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/kg.
4. When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

Bluetooth - Maximum Average Power		
Test Mode	Data Rate	Average Power(dBm)
GFSK	1Mbps	0.204
Pi/4 QDPSK	2Mbps	-0.816
8DPSK	3Mbps	-0.578

Bluetooth - Maximum Average Power				
Test Mode	Data Rate	Channel	Frequency (MHz)	Average Power (dBm)
BLE	1Mbps	CH 00	2402	-4.415
		CH 19	2440	-3.623
		CH 39	2480	-5.11

Remark:
Bluetooth maximum output power is 0.204dBm, and Maximum Tune-Up output power is 0.5dBm. Per KDB 447498 D01 V06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
where
-f(GHz) is the RF channel transmit frequency in GHz
-Power and distance are rounded to the nearest mW and mm before calculation17
-The result is rounded to one decimal place for comparison

Tune-Up Power (dBm)	Max. Power (mW)	Distance (mm)	Frequency (GHz)	Result	Limit
0.5	1.12	5	2.402	0.35	3

The exclusion threshold is 0.35< 3, therefore, the RF exposure evaluation is not required.

10.2 Test Results for Standalone SAR Test

Head SAR

GSM850 – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
1.	GSM	Right Cheek	190	836.6	33.09	33.5	1.0990	0.1553	0.1707
2.	GSM	Right Tilted	190	836.6	33.09	33.5	1.0990	0.0889	0.0977
3.	GSM	Left Cheek	190	836.6	33.09	33.5	1.0990	0.1300	0.1429
4.	GSM	Left Tilted	190	836.6	33.09	33.5	1.0990	0.0807	0.0887

GSM1900 – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
5.	GSM	Right Cheek	512	1850.2	30.04	30.5	1.1117	0.0267	0.0297
6.	GSM	Right Tilted	512	1850.2	30.04	30.5	1.1117	0.0097	0.0108
7.	GSM	Left Cheek	512	1850.2	30.04	30.5	1.1117	0.0221	0.0246
8.	GSM	Left Tilted	512	1850.2	30.04	30.5	1.1117	0.0090	0.0100

GPRS850 – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
9.	GPRS_4TX	Right Cheek	128	824.2	29.42	29.5	1.0186	0.3242	0.3302
10.	GPRS_4TX	Right Tilted	128	824.2	29.42	29.5	1.0186	0.1927	0.1963
11.	GPRS_4TX	Left Cheek	128	824.2	29.42	29.5	1.0186	0.3149	0.3208
12.	GPRS_4TX	Left Tilted	128	824.2	29.42	29.5	1.0186	0.2223	0.2264

GPRS1900 – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	M Hz					
13.	GPRS_2TX	Right Cheek	512	1850.2	29.23	29.5	1.0641	0.1890	0.2011
14.	GPRS_2TX	Right Tilted	512	1850.2	29.23	29.5	1.0641	0.0522	0.0555
15.	GPRS_2TX	Left Cheek	512	1850.2	29.23	29.5	1.0641	0.0757	0.0806
16.	GPRS_2TX	Left Tilted	512	1850.2	29.23	29.5	1.0641	0.0362	0.0385

WCDMA Band 2 – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
17.	RMC	Right Cheek	9538	1907.6	22.79	23.0	1.0495	0.0404	0.0424
18.	RMC	Right Tilted	9538	1907.6	22.79	23.0	1.0495	0.0220	0.0231
19.	RMC	Left Cheek	9538	1907.6	22.79	23.0	1.0495	0.0439	0.0461
20.	RMC	Left Tilted	9538	1907.6	22.79	23.0	1.0495	0.0253	0.0266

WCDMA Band 5 – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
21.	RMC	Right Cheek	4183	836.6	22.34	22.5	1.0375	0.1514	0.1571
22.	RMC	Right Tilted	4183	836.6	22.34	22.5	1.0375	0.0641	0.0665
23.	RMC	Left Cheek	4183	836.6	22.34	22.5	1.0375	0.1378	0.1430
24.	RMC	Left Tilted	4183	836.6	22.34	22.5	1.0375	0.0892	0.0925

LTE Band 4– Head SAR Test								
Plot No.	Mode	Test Position Head	Frequency	Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
	Modulation, Bandwidth, RB		MHz					
25.	QPSK 20MHz 1RB	Right Cheek	1745.0	24.04	24.5	1.1117	0.0875	0.0973
26.	QPSK 20MHz 1RB	Right Tilted	1745.0	24.04	24.5	1.1117	0.0296	0.0329
27.	QPSK 20MHz 1RB	Left Cheek	1745.0	24.04	24.5	1.1117	0.0363	0.0404
28.	QPSK 20MHz 1RB	Left Tilted	1745.0	24.04	24.5	1.1117	0.0129	0.0143
29.	QPSK 20MHz 50%RB	Right Cheek	1745.0	23.71	24.0	1.0691	0.0673	0.0719
30.	QPSK 20MHz 50%RB	Right Tilted	1745.0	23.71	24.0	1.0691	0.0192	0.0205
31.	QPSK 20MHz 50%RB	Left Cheek	1745.0	23.71	24.0	1.0691	0.0292	0.0312
32.	QPSK 20MHz 50%RB	Left Tilted	1745.0	23.71	24.0	1.0691	0.0096	0.0103

LTE Band 7– Head SAR Test								
Plot No.	Mode	Test Position Head	Frequency	Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
	Modulation, Bandwidth		MHz					
33.	QPSK 20MHz 1RB	Right Cheek	2510.0	23.19	23.5	1.0740	0.1653	0.1775
34.	QPSK 20MHz 1RB	Right Tilted	2510.0	23.19	23.5	1.0740	0.0553	0.0594
35.	QPSK 20MHz 1RB	Left Cheek	2510.0	23.19	23.5	1.0740	0.1375	0.1477
36.	QPSK 20MHz 1RB	Left Tilted	2510.0	23.19	23.5	1.0740	0.0311	0.0334
37.	QPSK 20MHz 50%RB	Right Cheek	2560.0	22.21	22.5	1.0691	0.1383	0.1479
38.	QPSK 20MHz 50%RB	Right Tilted	2560.0	22.21	22.5	1.0691	0.0356	0.0381
39.	QPSK 20MHz 50%RB	Left Cheek	2560.0	22.21	22.5	1.0691	0.1286	0.1375

40.	RMC QPSK 20MHz 50%RB	Left Tilted	2560.0	22.21	22.5	1.0691	0.0754	0.0806

WLAN 2.4GHz – Head SAR Test									
Plot No.	**Mode**	**Test Position Head**	**Frequency**		**Output Power (dBm)**	**Max. Tune-up power (dBm)**	**Scaling Factor**	**SAR1g (W/kg)**	**Scaled SAR1g (W/kg)**
			CH.	**MHz**					
41.	802.11 b	Right Cheek	01	2412	13.10	13.5	1.0965	0.2840	0.3114
42.	802.11 b	Right Tilted	01	2412	13.10	13.5	1.0965	0.2898	0.3178
43.	802.11 b	Left Cheek	01	2412	13.10	13.5	1.0965	0.2442	0.2678
44.	802.11 b	Left Tilted	01	2412	13.10	13.5	1.0965	0.2820	0.3092

Remark:
1. Per KDB 447498 D01 v06, if the highest output channel SAR for each exposure position ≤ 0.8 W/kg other channels SAR tests are not necessary.
2. Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg;

Body-worn SAR

GSM850 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
45.	GSM	Back	190	836.6	33.09	33.5	1.0990	0.2082	0.2288
46.	GSM	Front	190	836.6	33.09	33.5	1.0990	0.1739	0.1911

GSM1900 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
47.	GSM	Back	512	1850.2	30.04	30.5	1.1117	0.2839	0.3156
48.	GSM	Front	512	1850.2	30.04	30.5	1.1117	0.2235	0.2485

WCDMA Band 2 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
57	RMC 12.2k	Back Side	9538	1907.6	22.79	23.0	1.0495	0.2367	0.2484
58	RMC 12.2k	Front Side	9538	1907.6	22.79	23.0	1.0495	0.2182	0.2290

WCDMA Band 5 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
61	RMC 12.2k	Back Side	4183	836.6	22.34	22.5	1.0375	0.1524	0.1581
62	RMC 12.2k	Front Side	4183	836.6	22.34	22.5	1.0375	0.1359	0.1410

LTE Band 4–Body SAR Test (Gap: 10mm)								
Plot No.	Mode	Test Position Body	Frequency	Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
	Modulation, Bandwidth, RB		MHz					
65	QPSK 20MHz 1RB	Back Side	1745.0	24.04	24.5	1.1117	0.4136	0.4598
66	QPSK 20MHz 1RB	Front Side	1745.0	24.04	24.5	1.1117	0.4630	0.5147
69	QPSK 20MHz 50%RB	Back Side	1745.0	23.71	24.0	1.0691	0.3783	0.4044
70	QPSK 20MHz 50%RB	Front Side	1745.0	23.71	24.0	1.0691	0.4282	0.4578

LTE Band 7–Body SAR Test (Gap: 10mm)								
Plot No.	Mode	Test Position Body	Frequency	Output Power (dBm)	Max. Tune-up power	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g
	Modulation, Bandwidth, RB		MHz					

					(dBm)			(W/kg)
73	QPSK 20MHz 1RB	Back Side	2510.0	23.19	23.5	1.0740	0.4664	0.5009
74	QPSK 20MHz 1RB	Front Side	2510.0	23.19	23.5	1.0740	0.3485	0.3743
77	QPSK 20MHz 50%RB	Back Side	2560.0	22.21	22.5	1.0691	0.4136	0.4422
78	QPSK 20MHz 50%RB	Front Side	2560.0	22.21	22.5	1.0691	0.3012	0.3220

WLAN 2.4GHz –Body SAR Test									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
81	802.11b	Back Side	01	2412	13.10	13.5	1.0965	0.0986	0.1081
82	802.11b	Front Side	01	2412	13.10	13.5	1.0965	0.0628	0.0689

Remark:
1. Per KDB 447498 D01 v06, if the highest output channel SAR for each exposure position ≤ 0.8 W/kg other channels SAR tests are not necessary.
2. Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg;

Hotspot SAR

GSM850 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
49.	GPRS_4TX	Back Side	128	824.2	29.42	29.5	1.0186	0.4210	0.4288
50.	GPRS_4TX	Front Side	128	824.2	29.42	29.5	1.0186	0.3763	0.3833
51.	GPRS_4TX	Bottom side	128	824.2	29.42	29.5	1.0186	0.3308	0.3370
52.	GPRS_4TX	Left side	128	824.2	29.42	29.5	1.0186	0.2298	0.2341

GSM1900 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
53.	GPRS_2TX	Back Side	512	1850.2	29.23	29.5	1.0641	0.4669	0.4968
54.	GPRS_2TX	Front Side	512	1850.2	29.23	29.5	1.0641	0.3612	0.3844
55.	GPRS_2TX	Bottom side	512	1850.2	29.23	29.5	1.0641	0.5117	0.5445
56.	GPRS_2TX	Left side	512	1850.2	29.23	29.5	1.0641	0.0365	0.0388

WCDMA Band 2 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
57.	RMC 12.2k	Back Side	9538	1907.6	22.79	23.0	1.0495	0.2367	0.2484
58.	RMC 12.2k	Front Side	9538	1907.6	22.79	23.0	1.0495	0.2182	0.2290
59.	RMC 12.2k	Bottom side	9538	1907.6	22.79	23.0	1.0495	0.3294	0.3457
60.	RMC 12.2k	Left side	9538	1907.6	22.79	23.0	1.0495	0.0407	0.0427

WCDMA Band 5 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
61.	RMC 12.2k	Back Side	4183	836.6	22.34	22.5	1.0375	0.1524	0.1581
62.	RMC 12.2k	Front Side	4183	836.6	22.34	22.5	1.0375	0.1359	0.1410
63.	RMC 12.2k	Bottom side	4183	836.6	22.34	22.5	1.0375	0.1052	0.1091
64.	RMC 12.2k	Left side	4183	836.6	22.34	22.5	1.0375	0.0594	0.0616

LTE Band 4–Body SAR Test (Gap: 10mm)								
Plot No.	Mode	Test Position Body	Frequency	Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
	Modulation, Bandwidth, RB		MHz					
65.	QPSK 20MHz 1RB	Back Side	1745.0	24.04	24.5	1.1117	0.4136	0.4598
66.	QPSK 20MHz 1RB	Front Side	1745.0	24.04	24.5	1.111	0.4630	0.514

						7		7
67.	QPSK 20MHz 1RB	Bottom side	1745.0	24.04	24.5	1.1117	0.5797	0.6445
68.	QPSK 20MHz 1RB	Left side	1745.0	24.04	24.5	1.1117	0.0601	0.0668
69.	QPSK 20MHz 50%RB	Back Side	1745.0	23.71	24.0	1.0691	0.3783	0.4044
70.	QPSK 20MHz 50%RB	Front Side	1745.0	23.71	24.0	1.0691	0.4282	0.4578
71.	QPSK 20MHz 50%RB	Bottom side	1745.0	23.71	24.0	1.0691	0.4638	0.4958
72.	QPSK 20MHz 50%RB	Left side	1745.0	23.71	24.0	1.0691	0.0433	0.0463

LTE Band 7–Body SAR Test (Gap: 10mm)								
Plot No.	Mode	Test Position Body	Frequency	Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
	Modulation, Bandwidth, RB		MHz					
73.	QPSK 20MHz 1RB	Back Side	2510.0	23.19	23.5	1.0740	0.4664	0.5009
74.	QPSK 20MHz 1RB	Front Side	2510.0	23.19	23.5	1.0740	0.3485	0.3743
75.	QPSK 20MHz 1RB	Bottom side	2510.0	23.19	23.5	1.0740	0.3098	0.3327
76.	QPSK 20MHz 1RB	Left side	2510.0	23.19	23.5	1.0740	0.0945	0.1015
77.	QPSK 20MHz 50%RB	Back Side	2560.0	22.21	22.5	1.0691	0.4136	0.4422
78.	QPSK 20MHz 50%RB	Front Side	2560.0	22.21	22.5	1.0691	0.3012	0.3220
79.	QPSK 20MHz 50%RB	Bottom side	2560.0	22.21	22.5	1.0691	0.2632	0.2814
80.	QPSK 20MHz 50%RB	Left side	2560.0	22.21	22.5	1.0691	0.0638	0.0682

WLAN 2.4GHz –Body SAR Test									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Max. Tune-up power (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
81.	802.11b	Back Side	01	2412	13.10	13.5	1.0965	0.0986	0.1081
82.	802.11b	Front Side	01	2412	13.10	13.5	1.0965	0.0628	0.0689
83.	802.11b	Top Side	01	2412	13.10	13.5	1.0965	0.0543	0.0595

Remark:
1. Per KDB 447498 D01 v06, if the highest output channel SAR for each exposure position ≤ 0.8 W/kg other channels SAR tests are not necessary.
2. Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg;

10.3 Simultaneous Multi-band Transmission SAR Analysis

Below list of Mode for Simultaneous Multi-band Transmission

No.	Configurations	Head SAR	Body-worn SAR	Hotspot SAR
1	GSM(Voice) + WLAN(Data)	Yes	Yes	-
2	GPRS/ EDGE(Data) + WLAN(Data)	-	-	Yes
3	WCDMA (Voice)+ WLAN(Data)	Yes	Yes	-
4	HSDPA(Data) + WLAN(Data)	-	-	Yes
5	HSUPA(Data) + WLAN(Data)	-	-	Yes
6	LTE(Data) + WLAN(Data)	-	-	Yes
7	GSM(Voice) + Bluetooth(Data)	Yes	Yes	-
8	GPRS/ EDGE(Data) + Bluetooth(Data)	-	-	Yes
9	WCDMA(Voice) + Bluetooth(Data)	Yes	Yes	-
10	HSDPA(Data)+ Bluetooth(Data)	-	-	Yes
11	HSUPA(Data) + Bluetooth(Data)	-	-	Yes
12	LTE(Data) + Bluetooth(Data)	-	-	Yes

Remark:
1. GSM and WCDMA share the same antenna, and cannot transmit simultaneously.
2. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
3. According to the KDB 447498 D01 v06, 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, and x = 18.75 for 10-g SAR.
For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01 v06 as below table.
4. The maximum SAR summation is calculated based on the same configuration and test position.

Bluetooth:

Tune-Up Power (dBm)	Max. Power (mW)	Distance (mm)	Frequency (GHz)	X	SAR(1g) 5mm	SAR(1g) 10mm
0.5	1.12	5/10	2.402	7.5	0.0463	0.0231

Head SAR

WWAN and WLAN

	WWAN		WLAN	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Right Cheek	GSM850	0.1707	0.3114	0.4821
Right Tilted	GSM850	0.0977	0.3178	0.4155
Left Cheek	GSM850	0.1429	0.2678	0.4107
Left Tilted	GSM850	0.0887	0.3092	0.3979
Right Cheek	GSM1900	0.0297	0.3114	0.3411
Right Tilted	GSM1900	0.0108	0.3178	0.3286
Left Cheek	GSM1900	0.0246	0.2678	0.2924
Left Tilted	GSM1900	0.0100	0.3092	0.3192
Right Cheek	GPRS850	0.3302	0.3114	**0.6416**
Right Tilted	GPRS850	0.1963	0.3178	0.5141
Left Cheek	GPRS850	0.3208	0.2678	0.5886
Left Tilted	GPRS850	0.2264	0.3092	0.5356
Right Cheek	GPRS1900	0.2011	0.3114	0.5125
Right Tilted	GPRS1900	0.0555	0.3178	0.3733
Left Cheek	GPRS1900	0.0806	0.2678	0.3484
Left Tilted	GPRS1900	0.0385	0.3092	0.3477
Right Cheek	WCDMA Band 2	0.0424	0.3114	0.3538
Right Tilted	WCDMA Band 2	0.0231	0.3178	0.3409
Left Cheek	WCDMA Band 2	0.0461	0.2678	0.3139
Left Tilted	WCDMA Band 2	0.0266	0.3092	0.3358
Right Cheek	WCDMA Band 5	0.1571	0.3114	0.4685
Right Tilted	WCDMA Band 5	0.0665	0.3178	0.3843
Left Cheek	WCDMA Band 5	0.1430	0.2678	0.4108
Left Tilted	WCDMA Band 5	0.0925	0.3092	0.4017
Right Cheek	LTE Band 4	0.0973	0.3114	0.4087
Right Tilted	LTE Band 4	0.0329	0.3178	0.3507
Left Cheek	LTE Band 4	0.0404	0.2678	0.3082
Left Tilted	LTE Band 4	0.0143	0.3092	0.3235
Right Cheek	LTE Band 7	0.1775	0.3114	0.4889
Right Tilted	LTE Band 7	0.0594	0.3178	0.3772
Left Cheek	LTE Band 7	0.1477	0.2678	0.4155
Left Tilted	LTE Band 7	0.0334	0.3092	0.3426

WWAN and Bluetooth

	WWAN		Bluetooth	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Right Cheek	GSM850	0.1707	0.0463	0.217
Right Tilted	GSM850	0.0977	0.0463	0.144
Left Cheek	GSM850	0.1429	0.0463	0.1892
Left Tilted	GSM850	0.0887	0.0463	0.135
Right Cheek	GSM1900	0.0297	0.0463	0.076
Right Tilted	GSM1900	0.0108	0.0463	0.0571
Left Cheek	GSM1900	0.0246	0.0463	0.0709
Left Tilted	GSM1900	0.0100	0.0463	0.0563
Right Cheek	GPRS850	0.3302	0.0463	**0.3765**
Right Tilted	GPRS850	0.1963	0.0463	0.2426
Left Cheek	GPRS850	0.3208	0.0463	0.3671
Left Tilted	GPRS850	0.2264	0.0463	0.2727
Right Cheek	GPRS1900	0.2011	0.0463	0.2474
Right Tilted	GPRS1900	0.0555	0.0463	0.1018
Left Cheek	GPRS1900	0.0806	0.0463	0.1269
Left Tilted	GPRS1900	0.0385	0.0463	0.0848
Right Cheek	WCDMA Band 2	0.0424	0.0463	0.0887
Right Tilted	WCDMA Band 2	0.0231	0.0463	0.0694
Left Cheek	WCDMA Band 2	0.0461	0.0463	0.0924
Left Tilted	WCDMA Band 2	0.0266	0.0463	0.0729
Right Cheek	WCDMA Band 5	0.1571	0.0463	0.2034
Right Tilted	WCDMA Band 5	0.0665	0.0463	0.1128
Left Cheek	WCDMA Band 5	0.1430	0.0463	0.1893
Left Tilted	WCDMA Band 5	0.0925	0.0463	0.1388
Right Cheek	LTE Band 4	0.0973	0.0463	0.1436
Right Tilted	LTE Band 4	0.0329	0.0463	0.0792
Left Cheek	LTE Band 4	0.0404	0.0463	0.0867
Left Tilted	LTE Band 4	0.0143	0.0463	0.0606
Right Cheek	LTE Band 7	0.1775	0.0463	0.2238
Right Tilted	LTE Band 7	0.0594	0.0463	0.1057
Left Cheek	LTE Band 7	0.1477	0.0463	0.194
Left Tilted	LTE Band 7	0.0334	0.0463	0.0797

Body-worn SAR

WWAN and WLAN

	WWAN		WLAN	Summed SAR (W/kg)
Position	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Back	GSM850	0.2288	0.1081	0.3369
Front	GSM850	0.1911	0.0689	0.26
Back	GSM1900	0.3156	0.1081	0.4237
Front	GSM1900	0.2485	0.0689	0.3174
Back	WCDMA Band 2	0.2484	0.1081	0.3565
Front	WCDMA Band 2	0.2290	0.0689	0.2979
Back	WCDMA Band 5	0.1581	0.1081	0.2662
Front	WCDMA Band 5	0.1410	0.0689	0.2099
Back	LTE Band 4	0.4598	0.1081	0.5679
Front	LTE Band 4	0.5147	0.0689	0.5836
Back	LTE Band 7	0.5009	0.1081	**0.609**
Front	LTE Band 7	0.3743	0.0689	0.4432

WWAN and Bluetooth

	WWAN		Bluetooth	Summed SAR (W/kg)
Position	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Back	GSM850	0.2288	0.0231	0.2519
Front	GSM850	0.1911	0.0231	0.2142
Back	GSM1900	0.3156	0.0231	0.3387
Front	GSM1900	0.2485	0.0231	0.2716
Back	WCDMA Band 2	0.2484	0.0231	0.2715
Front	WCDMA Band 2	0.2290	0.0231	0.2521
Back	WCDMA Band 5	0.1581	0.0231	0.1812
Front	WCDMA Band 5	0.1410	0.0231	0.1641
Back	LTE Band 4	0.4598	0.0231	0.4829
Front	LTE Band 4	0.5147	0.0231	**0.5378**
Back	LTE Band 7	0.5009	0.0231	0.524
Front	LTE Band 7	0.3743	0.0231	0.3974

Hotspot SAR

WWAN and WLAN

	WWAN		WLAN	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	GSM850	0.4288	0.1081	0.5369
Front	GSM850	0.3833	0.0689	0.4522
Top side	GSM850	--	0.0595	0.0595
Bottom side	GSM850	0.3370	--	0.3370
Right side	GSM850	--	--	--
Left side	GSM850	0.2341	--	0.2341
Back	GSM1900	0.4968	0.1081	0.6049
Front	GSM1900	0.3844	0.0689	0.4533
Top side	GSM1900	--	0.0595	0.0595
Bottom side	GSM1900	0.5445	--	0.5445
Right side	GSM1900	--	--	--
Left side	GSM1900	0.0388	--	0.0388
Back	WCDMA Band 2	0.2484	0.1081	0.3565
Front	WCDMA Band II	0.2290	0.0689	0.2979
Top side	WCDMA Band 2	--	0.0595	0.0595
Bottom side	WCDMA Band 2	0.3457	--	0.3457
Right side	WCDMA Band 2	--	--	--
Left side	WCDMA Band 2	0.0427	--	0.0427
Back	WCDMA Band 5	0.1581	0.1081	0.2662
Front	WCDMA Band 5	0.1410	0.0689	0.2099
Top side	WCDMA Band 5	--	0.0595	0.0595
Bottom side	WCDMA Band 5	0.1091	--	0.1091
Right side	WCDMA Band 5	--	--	--
Left side	WCDMA Band 5	0.0616	--	0.0616
Back	LTE Band 4	0.4598	0.1081	0.5679
Front	LTE Band 4	0.5147	0.0689	0.5836
Top side	LTE Band 4	--	0.0595	0.0595
Bottom side	LTE Band 4	0.6445	--	**0.6445**
Right side	LTE Band 4	--	--	--
Left side	LTE Band 4	0.0668	--	0.0668
Back	LTE Band 7	0.5009	0.1081	0.609
Front	LTE Band 7	0.3743	0.0689	0.4432
Top side	LTE Band 7	--	0.0595	0.0595
Bottom side	LTE Band 7	0.3327	--	0.3327
Right side	LTE Band 7	--	--	--
Left side	LTE Band 7	0.1015	--	0.1015

WWAN and Bluetooth

	WWAN		Bluetooth	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	GSM850	0.4288	0.0231	0.4519
Front	GSM850	0.3833	0.0231	0.4064
Top side	GSM850	--	0.0231	0.0231
Bottom side	GSM850	0.3370	--	0.3370
Right side	GSM850	--	--	--
Left side	GSM850	0.2341	--	0.2341
Back	GSM1900	0.4968	0.0231	0.5199

Front	GSM1900	0.3844	0.0231	0.4075
Top side	GSM1900	--	0.0231	0.0231
Bottom side	GSM1900	0.5445	--	0.5445
Right side	GSM1900	--	--	--
Left side	GSM1900	0.0388	--	0.0388
Back	WCDMA Band 2	0.2484	0.0231	0.2715
Front	WCDMA Band 2	0.2290	0.0231	0.2521
Top side	WCDMA Band 2	--	0.0231	0.0231
Bottom side	WCDMA Band 2	0.3457	--	0.3457
Right side	WCDMA Band 2	--	--	--
Left side	WCDMA Band 2	0.0427	--	0.0427
Back	WCDMA Band 5	0.1581	0.0231	0.1812
Front	WCDMA Band 5	0.1410	0.0231	0.1641
Top side	WCDMA Band 5	--	0.0231	0.0231
Bottom side	WCDMA Band 5	0.1091	--	0.1091
Right side	WCDMA Band 5	--	--	--
Left side	WCDMA Band 5	0.0616	--	0.0616
Back	LTE Band 4	0.4598	0.0231	0.4829
Front	LTE Band 4	0.5147	0.0231	0.5378
Top side	LTE Band 4	--	0.0231	0.0231
Bottom side	LTE Band 4	0.6445	--	**0.6445**
Right side	LTE Band 4	--	--	--
Left side	LTE Band 4	0.0668	--	0.0668
Back	LTE Band 7	0.5009	0.0231	0.524
Front	LTE Band 7	0.3743	0.0231	0.3974
Top side	LTE Band 7	--	0.0231	0.0231
Bottom side	LTE Band 7	0.3327	--	0.3327
Right side	LTE Band 7	--	--	--
Left side	LTE Band 7	0.1015	--	0.1015

11. Measurement Uncertainty

11.1 Uncertainty for EUT SAR Test

a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/e	k
Uncertainty Component	**Sec.**	**Tol (+- %)**	**Prob. Dist.**	**Div.**	**Ci (1g)**	**Ci (10g)**	**1g Ui (+-%)**	**10g Ui (+-%)**	**Vi**
Measurement System									
Probe calibration	E.2.1	7.0	N	1	1	1	7.00	7.00	∝
Axial Isotropy	E.2.2	2.5	R	√3	(1_Cp)^1/2	(1_Cp)^1/2	1.02	1.02	∝
Hemispherical Isotropy	E.2.2	4.0	R	√3	(Cp)^1/2	(Cp)^1/2	1.63	1.63	∝
Boundary effect	E.2.3	1.0	R	√3	1	1	0.58	0.58	∝
Linearity	E.2.4	5.0	R	√3	1	1	2.89	2.89	∝
System detection limits	E.2.5	1.0	R	√3	1	1	0.58	0.58	∝
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.02	∝
Reponse Time	E.2.7	3.0	R	√3	1	1	1.73	1.73	∝
Integration Time	E.2.8	2.0	R	√3	1	1	1.15	1.15	∝
RF ambient Conditions – Noise	E.6.1	3.0	R	√3	1	1	1.73	1.73	∝
RF ambient Conditions - Reflections	E.6.1	3.0	R	√3	1	1	1.73	1.73	∝
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	√3	1	1	1.15	1.15	∝
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	√3	1	1	0.03	0.03	∝
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5	5.0	R	√3	1	1	2.89	2.89	∝
Test Sample Related									
Test sample positioning	E.4.2	0.03	N	1	1	1	0.03	0.03	N–1
Device Holder Uncertainty	E.4.1	5.00	N	1	1	1	5.00	5.00	
Output power Variation - SAR drift measurement	E.2.9	12.02	R	√3	1	1	6.94	6.94	∝
SAR scaling	E6.5	0.0	R	√3	1	1	0.0	0.0	∝
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	√3	1	1	0.03	0.03	∝
Uncertainty in SAR correction for deviations in permittivity and conductivity	E3.2	1.9	R	√3	1	0.84	1.10	0.90	∝
Liquid conductivity - deviation from target value	E.3.2	5.00	R	√3	0.64	0.43	1.85	1.24	∝
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	1	0.64	0.43	3.20	2.15	∝
Liquid permittivity -	E.3.2	0.37	R	√3	0.6	0.49	0.13	0.10	∝

deviation from target value									
Liquid permittivity - measurement uncertainty	E.3.3	10.00	N	1	0.6	0.49	6.00	4.90	∝
Combined Standard Uncertainty			RSS				12.98	12.53	
Expanded Uncertainty (95% Confidence interval)			K=2				25.32	24.43	

11.2 Uncertainty for System Performance Check

a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/e	k
Uncertainty Component	**Sec.**	**Tol (+- %)**	**Prob. Dist.**	**Div.**	**Ci (1g)**	**Ci (10g)**	**1g Ui (+-%)**	**10g Ui (+-%)**	**Vi**
Measurement System									
Probe calibration	E.2.1	7.0	N	1	1	1	7.00	7.00	∝
Axial Isotropy	E.2.2	2.5	R	√3	(1_Cp)^1/2	(1_Cp)^1/2	1.02	1.02	∝
Hemispherical Isotropy	E.2.2	4.0	R	√3	(Cp)^1/2	(Cp)^1/2	1.63	1.63	∝
Boundary effect	E.2.3	1.0	R	√3	1	1	0.58	0.58	∝
Linearity	E.2.4	5.0	R	√3	1	1	2.89	2.89	∝
System detection limits	E.2.5	1.0	R	√3	1	1	0.58	0.58	∝
Modulation response	E.2.5	0	R	√3	0	0	0.0	0.0	∝
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.02	∝
Reponse Time	E.2.7	3.0	R	√3	1	1	1.73	1.73	∝
Integration Time	E.2.8	2.0	R	√3	1	1	1.15	1.15	∝
RF ambient Conditions – Noise	E.6.1	3.0	R	√3	1	1	1.73	1.73	∝
RF ambient Conditions - Reflections	E.6.1	3.0	R	√3	1	1	1.73	1.73	∝
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	√3	1	1	1.15	1.15	∝
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	√3	1	1	0.03	0.03	∝
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	√3	1	1	2.89	2.89	∝
Dipole									
Dipole axis to liquid Distance	8,E.4.2	1.00	N	√3	1	1	0.58	0.58	N–1
Input power and SAR drift measurement	8,6.6.2	12.02	R	√3	1	1	6.94	6.94	∝
Deviation of experimental dipole from numerical dipole	E.6.4	5.5	R	√3	1	1	3.20	3.20	∝
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	√3	1	1	0.03	0.03	∝
Uncertainty in SAR correction for deviations in permittivity and conductivity	E3.2	2.0	R	√3	1	0.84	1.10	1.10	∝
Liquid conductivity - deviation from target value	E.3.2	5.00	R	√3	0.64	0.43	1.85	1.24	
Liquid conductivity -	E.3.3	5.00	N	1	0.64	0.43	3.20	2.15	

measurement uncertainty									
Liquid permittivity - deviation from target value	E.3.2	0.37	R	√3	0.6	0.49	0.13	0.10	
Liquid permittivity - measurement uncertainty	E.3.3	10.00	N	1	0.6	0.49	6.00	4.90	M
Combined Standard Uncertainty			RSS				12.00	11.50	
Expanded Uncertainty (95% Confidence interval)			K=2				23.39	22.43	

---END---