FCC SAR
Measurement and Test Report

For

Shenzhen Modern Cowboy Technology Co., Ltd.

RM1006, 10/F, Beike Mansion, Keyuan Road, Nanshan District, Shenzhen, China

FCC ID: 2AS4G-M16

Test Standards:	FCC Part 2.1093 ANSI / IEEE C95.1 :2005+A1:2010 ANSI / IEEE C95.3 : 2002(R2008) IEEE 1528 :2013
Product Description:	Mobile handset 4G/LTE
Tested Model:	M16
Report No.:	WTX19X04020466W-8
Sample Received Date:	2019-04-10
Tested Date:	2019-04-15 to 2019-04-17
Issued Date:	2018-04-18
Tested By:	Ruler Liu / Engineer
Reviewed By:	Silin Chen / EMC Manager
Approved & Authorized By:	Jandy So / PSQ Manager
Prepared By:	

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1. General Information

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	Shenzhen Modern Cowboy Technology Co., Ltd.
Address of applicant:	RM1006, 10/F, Beike Mansion, Keyuan Road, Nanshan District, Shenzhen, China
Manufacturer:	Shenzhen Modern Cowboy Technology Co., Ltd.
Address of manufacturer:	RM1006, 10/F, Beike Mansion, Keyuan Road, Nanshan District, Shenzhen, China

General Description of EUT:	
Product Name:	Mobile handset 4G/LTE
Brand Name:	VEAH
Model No.:	M16
Adding Model(s):	/
Rated Voltage:	DC3.7V by Battery
Battery:	2000mAh
Device Category:	Portable Device
Note: The test data is gathered from a production sample provided by the manufacturer.	

Technical Characteristics of EUT:	
2G	
Support Networks:	GSM, GPRS, EDGE
Support Band:	GSM850/PCS1900
Uplink Frequency:	GSM/GPRS/EDGE 850: 824~849MHz GSM/GPRS/EDGE 1900: 1850~1910MHz
Downlink Frequency:	GSM/GPRS/EDGE 850: 869~894MHz GSM/GPRS/EDGE 1900: 1930~1990MHz
RF Output Power:	GSM850: 32.48dBm, GSM1900: 29.96dBm EDGE850: 29.35dBm, EDGE1900: 25.99dBm
Type of Modulation:	GMSK, 8PSK
Type of Antenna:	Integral Antenna
Antenna Gain:	GSM850: 1.6dBi; GSM1900: 2.8dBi
GPRS/EDGE Class:	Class 12
3G	
Support Networks:	WCDMA, HSDPA, HSUPA
Support Band:	WCDMA Band 2, WCDMA Band 5
Uplink Frequency:	WCDMA Band 2: 1850~1910MHz WCDMA Band 5: 824~849MHz
Downlink Frequency:	WCDMA Band 2: 1930~1990MHz WCDMA Band 5: 869~894MHz
RF Output Power:	WCDMA Band 2: 23.26dBm, WCDMA Band 5: 23.69dBm
Type of Modulation:	BPSK
Antenna Type:	Integral Antenna
Antenna Gain:	WCDMA Band 2: 2.6dBi, WCDMA Band 5: 1.6dBi
4G	
Support Networks:	FDD-LTE
Support Band:	FDD-LTE Band 4, 5, 7
Uplink Frequency:	FDD-LTE Band 4: Tx: 1710-1755MHz, FDD-LTE Band 5: Tx: 824-849MHz, FDD-LTE Band 7: Tx: 2500-2570MHz,
Downlink Frequency:	FDD-LTE Band 4: Rx: 2110-2155MHz, FDD-LTE Band 5: Rx: 869-894MHz, FDD-LTE Band 7: Rx: 2620-2690MHz,
RF Output Power:	FDD-LTE Band 4: 24.6dBm, FDD-LTE Band 5: 24.99dBm, FDD-LTE Band 7: 24.2dBm,
Type of Modulation:	QPSK, 16QAM
Antenna Type:	Integral Antenna
Antenna Gain:	FDD-LTE Band 4: 2.6dBi,

	FDD-LTE Band 5: 1.6dBi, FDD-LTE Band 7: 1.2dBi,
WIFI(2.4G)	
Support Standards:	802.11b, 802.11g, 802.11n
Frequency Range:	2412-2462MHz for 11b/g/n(HT20) 2422-2452MHz for 11n(HT40)
RF Output Power:	16.16dBm (Conducted)
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 802.11n(HT40)
Channel Separation:	5MHz
Antenna Type:	Integral Antenna
Antenna Gain:	2.1dBi
Bluetooth	
Bluetooth Version:	V4.0
Frequency Range:	2402-2480MHz
RF Output Power:	5.427dBm (Conducted)
Data Rate:	1Mbps, 2Mbps, 3Mbps
Modulation:	GFSK, Pi/4 QDPSK, 8DPSK
Quantity of Channels:	79/40
Channel Separation:	1MHz/2MHz
Antenna Type:	Integral Antenna
Antenna Gain:	2.1dBi
WIFI(5G)	
Support Standards:	802.11a, 802.11n-HT20/40
Frequency Range:	Band 1: 5150-5250MHz, Band 4: 5725-5850MHz
RF Output Power:	12.35dBm (Conducted)
Type of Modulation:	QPSK, 16QAM, 64QAM
Type of Antenna:	Integral Antenna
Antenna Gain:	0.5dB

1.2 Test Standards

The following report is prepared on behalf of the Shenzhen Modern Cowboy Technology Co.,Ltd. in accordance with FCC 47 CFR Part 2.1093, ANSI/IEEE C95.1-2005, ANSI / IEEE C95.3 :2002, IEEE 1528-2013, KDB 447498 D01 v06, KDB 648474 D04 v01r03, KDB 248227 D01 v02r02, KDB 941225 D01 v03r01, KDB 941225 D05 v02r05 , and KDB 865664 D01 v01r04 and KDB 865664 D02 v01r02.

The objective is to determine compliance with FCC Part 2.1093 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with KDB 865664 D01 v01r04 and KDB 865664 D02 v01r02. The public notice KDB 447498 D01 v06 for Mobile and Portable Devices RF Exposure Procedure also.

1.4 Test Facility

FCC – Registration No.: 125990

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

2. Summary of Test Results

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

Frequency Band	Head SAR	Body (10mm Gap)	SAR_{1g} Limit (W/kg)
	Maximum SAR_{1g} (W/kg)	Maximum SAR_{1g} (W/kg)	
GSM	0.304	0.898	1.6
WCDMA	**0.661**	**1.043**	1.6
FDD	0.387	0.988	1.6
WLAN 2.4G	0.220	0.117	1.6
WLAN 5.2G	0.221	0.124	1.6
WLAN 5.8G	0.308	0.183	1.6
Simultaneous Transmission	0.907	**1.175**	1.6

Remark:

*The highest reported SAR values for head, body, and simultaneous transmission conditions are **0.661W/kg, 1.043 W/kg, and 1.175W/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 C95.1-2005, and had been tested in accordance with the measurement methods and procedure specified in IEEE 1528-2013 and KDB 865664 D01 v01r04 and KDB 865664 D02 v01r02

3. Specific Absorption Rate (SAR)

3.1 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.

3.2 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.

4. SAR Measurement System

4.1 The 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.

4.2 Probe

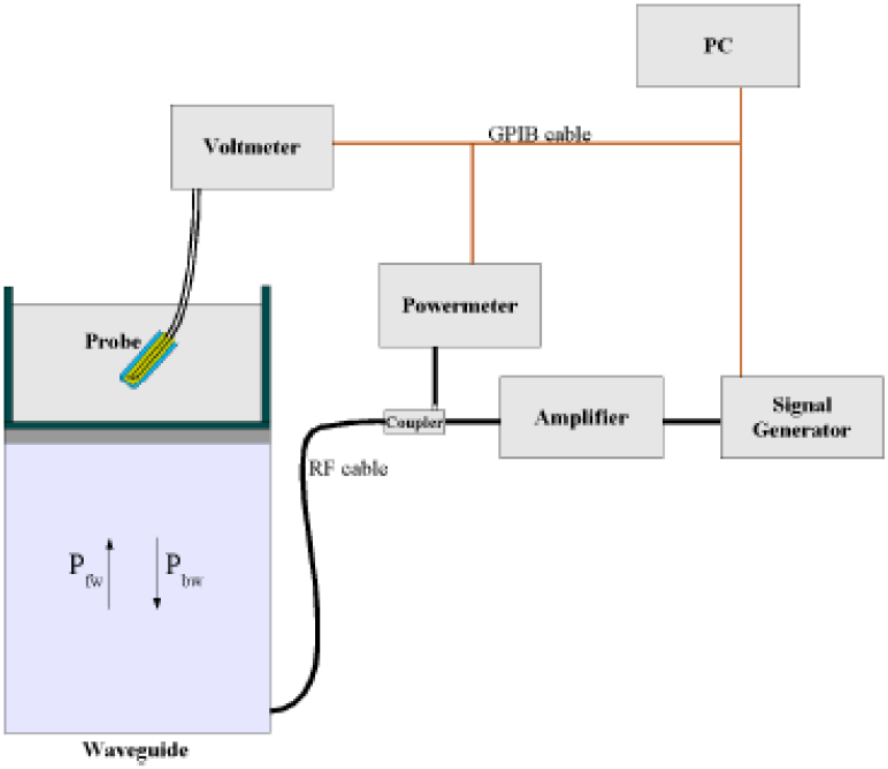
For the measurements the Specific Dosimetric E-Field Probe SSE5 SN 09/13 EP168 with following specifications is used

- 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:1ess 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.



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

Where :

Pfw = Forward Power

Pbw = Backward Power

a and b =Waveguide dimensions

I = 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:

$$CF(N)=SAR(N)/Vlin(N) \quad (N=1,2,3)$$

The linearised output voltage Vlin(N) is obtained from the displayed output voltage V(N) using

$$Vlin(N)=V(N)*(1+V(N)/DCP(N)) \quad (N=1,2,3)$$

where DCP is the diode compression point in mV.

4.3 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 an 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 $\Delta T/\Delta t$, 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.

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

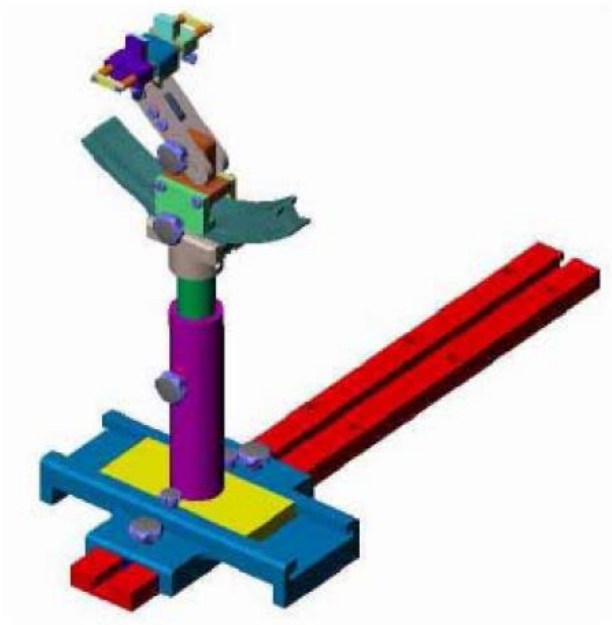
Where:
σ = simulated tissue conductivity,
ρ = Tissue density (1.25 g/cm3 for brain tissue)

4.4 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.

4.5 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

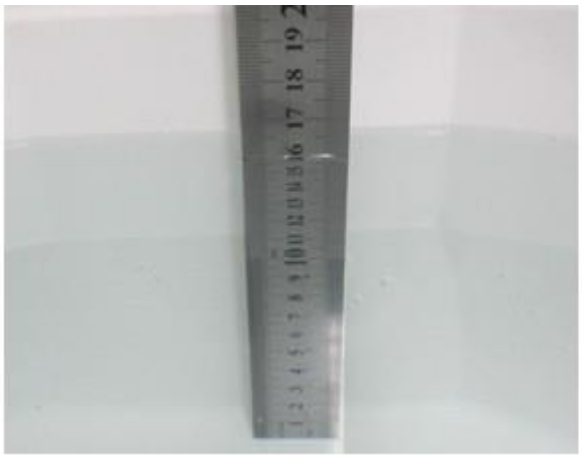
4.6 Test Equipment List

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
E-Field Probe	MVG	SSE5	SN 09/13 EP168	2018-06-01	2019-05-31
E-Field Probe	MVG	SSE2	SN 08/16 EPGO298	2018-09-10	2019-09-09
835MHz Dipole	MVG	SID835	SN 47/12 DIP 0G835-204	2019-03-16	2020-03-15
1800MHz Dipole	MVG	SID1800	SN 47/12 DIP 1G800-206	2019-03-16	2020-03-15
1900MHz Dipole	MVG	SID1900	SN 47/12 DIP 1G900-207	2019-03-16	2020-03-15
2450MHz Dipole	MVG	SID2450	SN 13/15 DIP 2G450-364	2019-03-16	2020-03-15
2600MHz Dipole	MVG	SID2600	SN 13/15 DIP 2G600-365	2019-03-16	2020-03-15
5 GHz Waveguide	MVG	SWG5500	SN 49/16 WGA45	2018-08-01	2019-07-31
Dielectric Probe Kit	MVG	SCLMP	SN 47/12 OCPG49	2019-03-16	2020-03-15
SAM Phantom	MVG	SAM	SN/ 47/12 SAM95	N/A	N/A
MULTIMETER	KEITHLEY	Keithley 2000	4006367	2018-05-22	2019-05-21
Signal Generator	Rohde & Schwarz	SMR20	100047	2018-05-22	2019-05-21
Universal Tester	Rohde & Schwarz	CMU200	112012	2018-05-22	2019-05-21
Communications Tester	Rohde & Schwarz	CMW500	148650	2018-05-22	2019-05-21
Network Analyzer	HP	8753C	2901A00831	2018-05-22	2019-05-21
Directional Couplers	Agilent	778D	20160	2018-05-22	2019-05-21

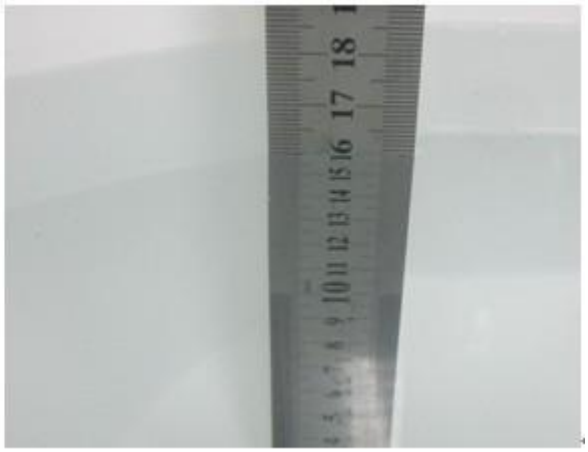
5. Tissue Simulating Liquids

5.1 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
1700-1900	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	48.1	0.1	0.1	0
1700-1900	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

Frequency (MHz)	Water (%)	Hexyl Carbitol (%)	Triton X-100 (%)
Head			
5000-6000	65.52	17.24	17.24
Body			
5000-6000	78.6	10.7	10.7

5.2 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
1750	**1.37**	**40.1**	**1.49**	**53.4**
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
5200	**4.66**	**36.0**	**5.30**	**49.0**
5800	**5.27**	**35.3**	**6.00**	**48.2**

5.3 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 (ε r)	Target (ε r)	Delta (%)		
835	21.2	0.87	0.90	-3.33	41.11	41.50	-0.94	±5	2019-04-15
1750	21.3	1.37	1.37	0.00	39.02	40.1	-2.69	±5	2019-04-16
1900	21.3	1.38	1.40	-1.43	38.56	40.00	-3.60	±5	2019-04-16
2450	21.3	1.74	1.80	-3.33	38.15	39.20	-2.68	±5	2019-04-17
2600	21.3	1.93	1.96	-1.53	38.63	39.0	-0.95	±5	2019-04-17
5200	21.3	4.87	4.66	4.51	35.6	36.0	-1.11	±5	2019-04-17
5800	21.3	5.17	5.27	-1.90	35.6	35.3	0.85	±5	2019-04-17

Body Tissue Simulating Liquid									
Freq. MHz.	Temp. (℃)	Conductivity			Permittivity			Limit (%)	Date
		Reading (σ)	Target (σ)	Delta (%)	Reading (ε r)	Target (ε r)	Delta (%)		
835	21.2	0.95	0.97	-2.06	54.85	55.20	-0.63	±5	2019-04-15
1750	21.3	1.46	1.49	-2.01	51.22	53.40	-4.08	±5	2019-04-16
1900	21.3	1.50	1.52	-1.32	52.42	53.30	-1.65	±5	2019-04-16
2450	21.3	1.91	1.95	-2.05	52.01	52.70	-1.31	±5	2019-04-17
2600	21.3	2.12	2.16	-1.85	52.24	52.50	-0.50	±5	2019-04-17
5200	21.3	5.16	5.30	-2.64	48.50	49.0	-1.02	±5	2019-04-17
5800	21.3	5.76	6.00	-4.00	48.50	48.2	0.62	±5	2019-04-17

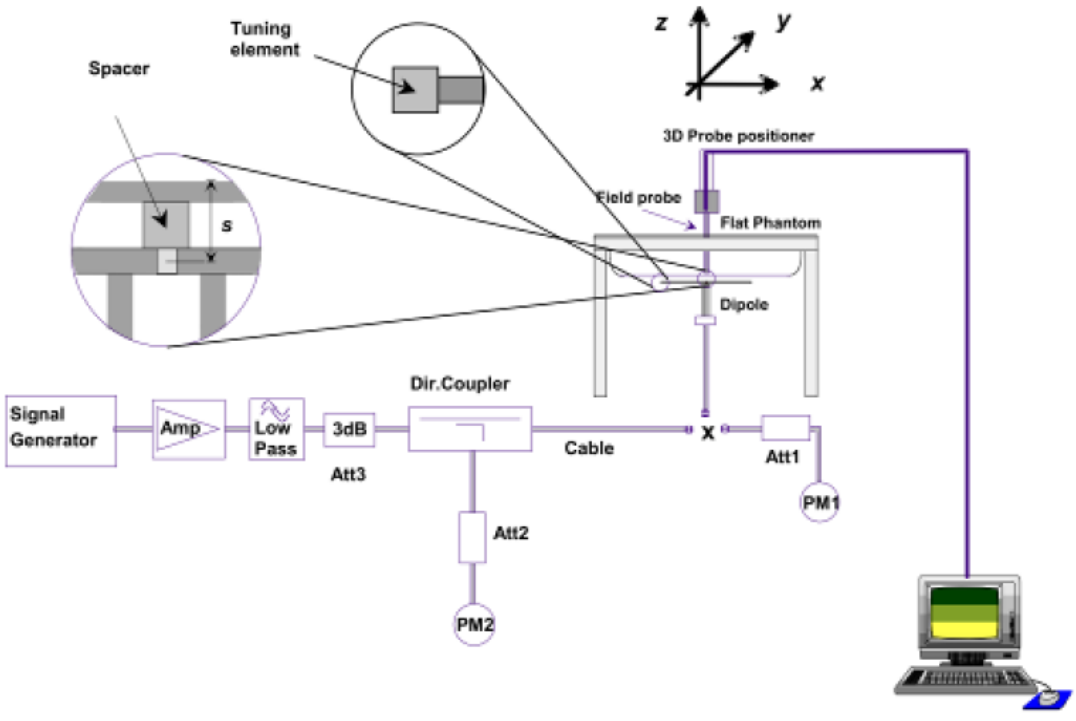
6. SAR Measurement Evaluation

6.1 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.

6.2 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 835MHz ,1800MHz, 1900MHz 2450MHz,2600MHz,and 5GHz. 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.
The output power on 5 GHz Waveguide must be calibrated to 20 dBm (100mW) before 5 GHz Waveguide is connected.

6.3 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	Date
MHz	(W/kg)	(W/kg)	(W/kg)	(%)	
Head					
835	9.65	2.41	9.64	-0.10	2019-04-15
1800	38.49	9.61	38.44	-0.13	2019-04-16
1900	39.59	9.91	39.64	0.13	2019-04-16
2450	53.76	13.45	53.8	0.07	2019-04-17
2600	55.07	13.67	54.68	-0.71	2019-04-17
Body					
835	9.36	2.35	9.4	0.43	2019-04-15
1800	38.29	9.58	38.32	0.08	2019-04-16
1900	39.01	9.78	39.12	0.28	2019-04-16
2450	50.33	12.59	50.36	0.06	2019-04-17
2600	53.92	13.43	53.72	-0.37	2019-04-17

Frequency	Liquid	Power (mw)	Targeted SAR1g	Measured SAR1g	Normalized SAR1g	Tolerance
5200	Head	100	161.23	16.946	169.46	5.10
5200	Body	100	154.45	16.681	166.81	8.00
5800	Head	100	179.32	17.191	171.91	-4.13
5800	Body	100	170.71	16.980	169.8	-0.53

Remark: Referring to IEEE 1528-2013, Section 8.2, The system check shall be performed at a test frequency that is within ±10% or ±100 MHz of the compliance test mid-band frequency, so the 1750 MHz system verification is made of 1800MHz Dipole.

Targeted and Measurement SAR

Please refer to Annex A for the plots of system performance check.

7. EUT Testing Position

7.1 Define Two Imaginary Lines on The Handset

(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.

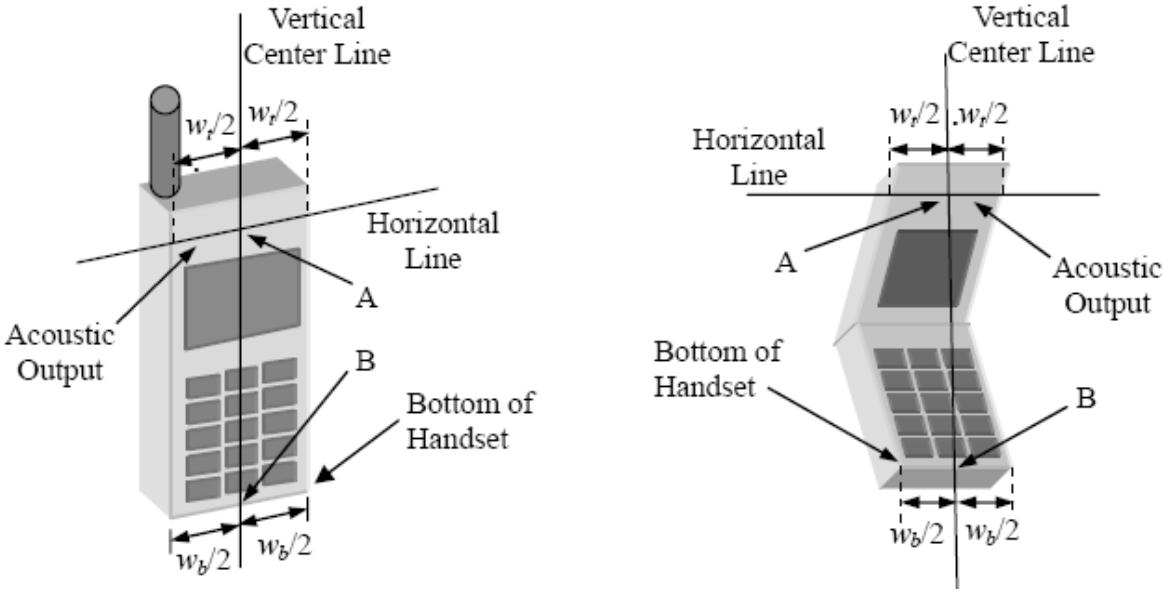


Illustration for Handset Vertical and Horizontal Reference Lines

7.2 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 (see Fig. 7.2).

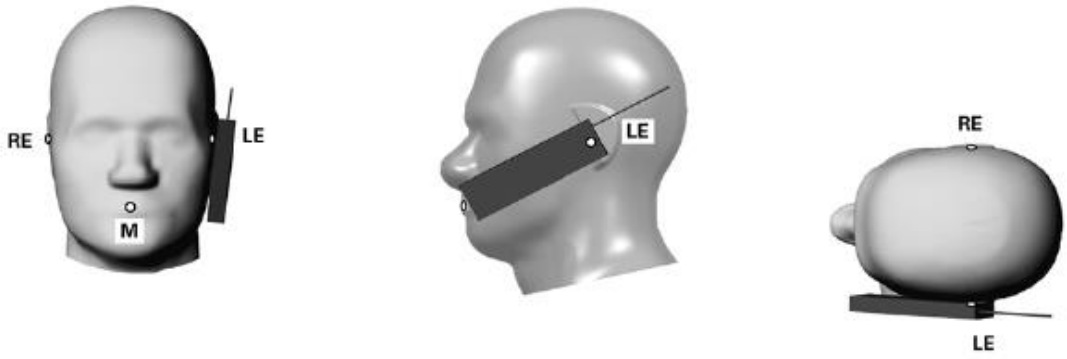


Illustration for Cheek Position

7.3 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 (see Fig. 7.3).

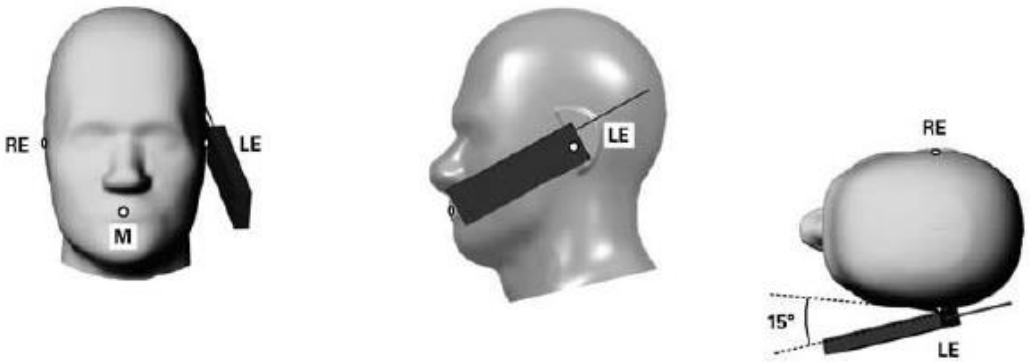


Illustration for Tilted Position

7.4 Body Position

(a) To position the device parallel to the phantom surface with each side.
(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.

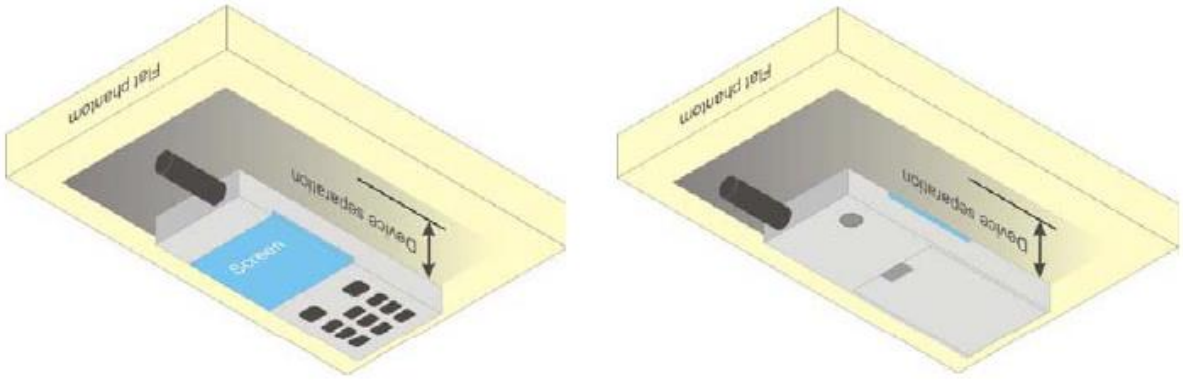
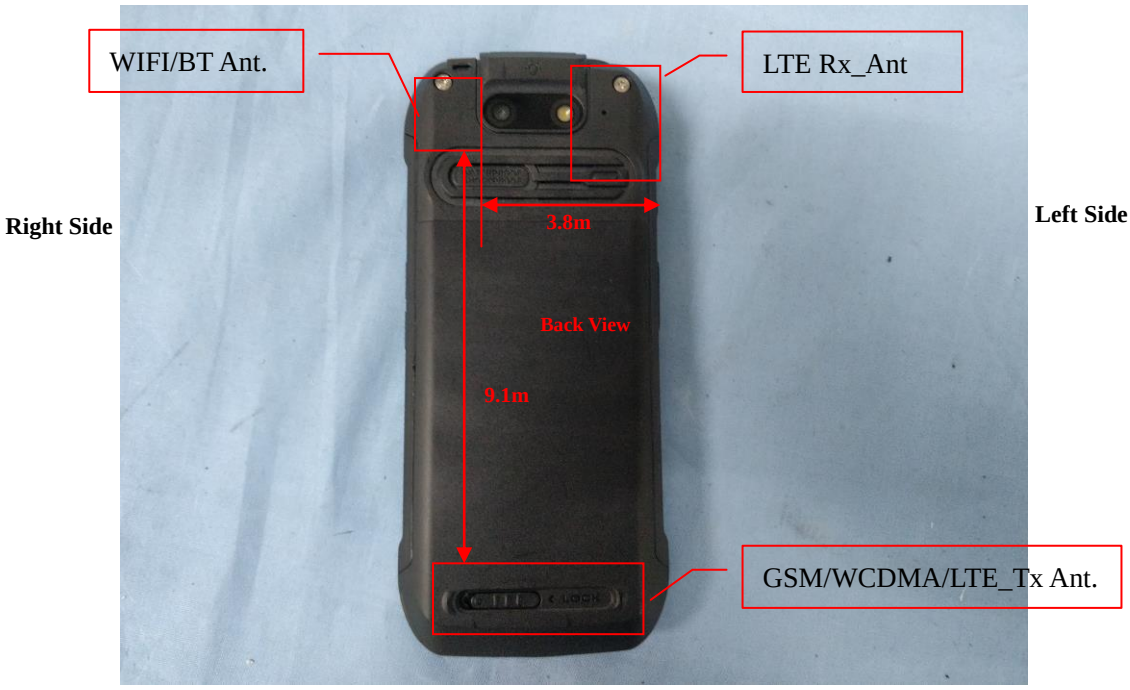


Illustration for Body Position

7.5 EUT Antenna Position

Top Side

Block Diagram for EUT Antenna Position



Bottom Side

7.6 EUT Testing Position

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

Remark:

1. Referring to KDB 447498 D01 v06, 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.

Please refer to Annex D for the EUT test setup photos.

8. SAR Measurement Procedures

8.1 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) Place the EUT in the positions as Annex D demonstrates.
(e) Set scan area, grid size and other setting on the SATIMO software.
(f) Measure SAR results for the highest power channel on each testing position.
(g) Find out the largest SAR result on these testing positions of each band
(h) 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:
(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

8.2 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

8.3 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.

8.4 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.

8.5 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.

8.6 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 drift more than 5%, the SAR will be retested.

9. SAR Test Result

9.1 Conducted RF Output Power

GSM - Burst Average Power (dBm)								
Band	**GSM850**			**Tune-up power (dBm)**	**PCS1900**			**Tune-up power (dBm)**
Channel	**128**	**190**	**251**		**512**	**661**	**810**	
Frequency (MHz)	**824.2**	**836.6**	**848.8**		**1850.2**	**1880**	**1909.8**	
GSM	32.38	32.44	32.48	32.5	29.81	29.90	29.80	30.0
GPRS (1 slot)	32.38	32.45	32.47	32.5	29.91	29.96	29.91	30.0
GPRS (2 slots)	31.27	31.30	31.32	31.5	28.81	28.89	28.88	29.0
GPRS (3 slots)	28.94	29.02	29.07	29.5	26.57	26.70	26.76	27.0
GPRS (4 slots)	27.81	27.92	27.95	28.0	25.47	25.58	25.64	26.0
EDGE (1 slot)	29.17	29.27	29.35	29.5	25.99	25.82	25.49	26.0
EDGE (2 slots)	28.27	28.37	28.40	28.5	25.01	24.87	24.57	25.5
EDGE (3 slots)	26.25	25.45	26.54	27.0	22.95	22.81	22.43	23.0
EDGE (4 slots)	25.36	25.43	25.49	25.5	21.83	21.69	21.36	22.0

GSM - Source-Based Time-Average Power (dBm)								
Band	**GSM850**			**Tune-up power (dBm)**	**PCS1900**			**Tune-up power (dBm)**
Channel	**128**	**190**	**251**		**512**	**661**	**810**	
Frequency (MHz)	**824.2**	**836.6**	**848.8**		**1850.2**	**1880**	**1909.8**	
GSM	23.38	23.44	23.48	23.5	20.81	20.90	20.80	21.0
GPRS (1 slot)	23.38	23.45	23.47	23.5	20.91	20.96	20.91	21.0
GPRS (2 slots)	25.27	25.30	25.32	25.5	22.81	22.89	22.88	23.0
GPRS (3 slots)	24.69	24.77	24.82	25.0	22.32	22.45	22.51	23.0
GPRS (4 slots)	24.81	24.92	24.95	25.0	22.47	22.58	22.64	23.0
EDGE (1 slot)	20.17	20.27	20.35	20.5	16.99	16.82	16.49	17.0
EDGE (2 slots)	22.27	22.37	22.40	22.5	19.01	18.87	18.57	19.5
EDGE (3 slots)	22.00	21.20	22.29	22.5	18.70	18.56	18.18	19.0
EDGE (4 slots)	22.36	22.43	22.49	22.5	18.83	18.69	18.36	19.0
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 (2TX 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.

5. The DUT do not support Hotspot function.

WCDMA - Average Power (dBm)								
Band	**WCDMA Band II**				**WCDMA Band V**			
Channel	**9262**	**9400**	**9538**	**Tune-up power (dBm)**	**4132**	**4183**	**4233**	**Tune-up power (dBm)**
Frequency (MHz)	**1852.4**	**1880.0**	**1907.6**		**826.4**	**836.4**	**846.6**	
RMC 12.2k	23.26	23.01	22.63	23.5	23.51	23.69	23.51	24.0
HSDPA Subtest-1	21.89	21.56	21.23	22.0	22.64	22.77	22.77	23.0
HSDPA Subtest-2	21.86	21.53	21.20	22.0	22.61	22.75	22.75	23.0
HSDPA Subtest-3	21.50	21.54	21.22	22.0	22.62	22.73	22.73	23.0
HSDPA Subtest-4	21.86	21.55	21.21	22.0	22.61	22.74	22.74	23.0
HSUPA Subtest-1	22.91	22.46	21.59	23.0	22.63	22.75	22.76	23.0
HSUPA Subtest-2	22.86	22.43	21.56	23.0	22.61	22.73	22.75	23.0
HSUPA Subtest-3	22.87	22.41	21.57	23.0	22.61	22.74	22.73	23.0
HSUPA Subtest-4	22.89	22.42	21.57	23.0	22.6	22.73	22.73	23.0
HSUPA Subtest-5	22.87	22.43	21.56	23.0	22.61	22.73	22.74	23.0

Remark:

1. per KDB 941225 D01 v03, The 12.2kbps RMC mode was selected for SAR testing(the primary mode).

2. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤1/4 dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode

FDD-LTE Band 4:

Channel Bandwidth: 1.4 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.89	0
		1	3	23.9	0
		1	5	23.91	0
		3	0	23.67	0
		3	2	23.61	0
		3	3	23.63	0
		6	0	22.79	1
	MCH	1	0	24.07	0
		1	3	23.98	0
		1	5	24.11	0
		3	0	23.23	0
		3	2	23.23	0
		3	3	23.25	0
		6	0	23.15	1
	HCH	1	0	24.45	0
		1	3	24.41	0
		1	5	24.47	0
		3	0	23.49	0
		3	2	23.41	0
		3	3	23.45	0
		6	0	22.93	1
16QAM	LCH	1	0	22.21	1
		1	3	22.29	1
		1	5	22.25	1
		3	0	22.82	1
		3	2	22.15	1
		3	3	22.85	1
		6	0	21.72	2
	MCH	1	0	23.29	1
		1	3	23.39	1
		1	5	23.37	1
		3	0	22.9	1
		3	2	23.12	1
		3	3	23	1
		6	0	22.27	2
	HCH	1	0	23.73	1
		1	3	23.74	1

		1	5	23.69	1
		3	0	23.01	1
		3	2	23.19	1
		3	3	23.15	1
		6	0	22.28	2

Channel Bandwidth: 3 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.97	0
		1	7	23.13	0
		1	14	23.1	0
		8	0	22.14	1
		8	4	22.16	1
		8	7	22.2	1
		15	0	22.15	1
	MCH	1	0	24.19	0
		1	7	24.23	0
		1	14	24.25	0
		8	0	23.25	1
		8	4	23.28	1
		8	7	23.31	1
		15	0	23.21	1
	HCH	1	0	24.4	0
		1	7	24.51	0
		1	14	24.47	0
		8	0	23.52	1
		8	4	23.54	1
		8	7	23.54	1
		15	0	23.57	1
16QAM	LCH	1	0	22.27	1
		1	7	22.42	1
		1	14	22.38	1
		8	0	21.18	2
		8	4	21.24	2
		8	7	21.28	2
		15	0	21.16	2
	MCH	1	0	23.39	1
		1	7	23.47	1
		1	14	23.49	1
		8	0	22.21	2
		8	4	22.24	2
		8	7	22.28	2

		15	0	22.18	2
	HCH	1	0	23.6	1
		1	7	23.56	1
		1	14	23.55	1
		8	0	22.5	2
		8	4	22.53	2
		8	7	22.58	2
		15	0	22.58	2

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.19	0
		1	12	23.34	0
		1	24	23.39	0
		12	0	22.25	1
		12	6	22.3	1
		12	13	22.38	1
		25	0	22.26	1
	MCH	1	0	24.36	0
		1	12	24.45	0
		1	24	24.47	0
		12	0	23.36	1
		12	6	23.43	1
		12	13	23.46	1
		25	0	23.38	1
	HCH	1	0	24.55	0
		1	12	24.53	0
		1	24	24.58	0
		12	0	23.55	1
		12	6	23.59	1
		12	13	23.58	1
		25	0	23.51	1
16QAM	LCH	1	0	22.42	1
		1	12	22.58	1
		1	24	22.64	1
		12	0	21.32	2
		12	6	21.35	2
		12	13	21.43	2
		25	0	21.29	2
	MCH	1	0	23.5	1
		1	12	23.62	1
		1	24	23.62	1

		12	0	22.48	2
		12	6	22.54	2
		12	13	22.56	2
		25	0	22.39	2
	HCH	1	0	23.64	1
		1	12	23.65	1
		1	24	23.68	1
		12	0	22.56	2
		12	6	22.59	2
		12	13	22.58	2
		25	0	22.54	2

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.1	0
		1	24	23.36	0
		1	49	23.56	0
		25	0	22.27	1
		25	12	22.4	1
		25	25	22.52	1
		50	0	22.39	1
	MCH	1	0	24.17	0
		1	24	24.4	0
		1	49	24.5	0
		25	0	23.27	1
		25	12	23.36	1
		25	25	23.44	1
		50	0	23.35	1
	HCH	1	0	24.57	0
		1	24	24.49	0
		1	49	24.51	0
		25	0	23.5	1
		25	12	23.5	1
		25	25	23.48	1
		50	0	23.49	1
16QAM	LCH	1	0	22.41	1
		1	24	22.67	1
		1	49	22.87	1
		25	0	21.3	2
		25	12	21.45	2
		25	25	21.55	2
		50	0	21.42	2

	MCH	1	0	23.5	1
		1	24	23.69	1
		1	49	23.8	1
		25	0	22.3	2
		25	12	22.4	2
		25	25	22.45	2
		50	0	22.4	2
	HCH	1	0	23.77	1
		1	24	23.69	1
		1	49	23.67	1
		25	0	22.53	2
		25	12	22.5	2
		25	25	22.5	2
		50	0	22.52	2

Channel Bandwidth: 15 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.12	0
		1	37	23.5	0
		1	74	23.85	0
		37	0	22.45	1
		37	18	22.62	1
		37	38	22.83	1
		75	0	22.65	1
	MCH	1	0	24.01	0
		1	37	24.35	0
		1	74	24.49	0
		37	0	23.29	1
		37	18	23.45	1
		37	38	23.55	1
		75	0	23.48	1
	HCH	1	0	24.53	0
		1	37	24.5	0
		1	74	24.52	0
		37	0	23.64	1
		37	18	23.61	1
		37	38	23.59	1
		75	0	23.62	1
16QAM	LCH	1	0	22.44	1
		1	37	22.82	1
		1	74	23.11	1
		37	0	21.44	2

		37	18	21.6	2
		37	38	21.81	2
		75	0	21.62	2
	MCH	1	0	23.26	1
		1	37	23.56	1
		1	74	23.66	1
		37	0	22.28	2
		37	18	22.41	2
		37	38	22.55	2
		75	0	22.41	2
	HCH	1	0	23.69	1
		1	37	23.73	1
		1	74	23.67	1
		37	0	22.59	2
		37	18	22.56	2
		37	38	22.52	2
		75	0	22.59	2

Channel Bandwidth: 20 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.99	0
		1	49	23.74	0
		1	99	24.27	0
		50	0	22.46	1
		50	25	22.66	1
		50	50	22.97	1
		100	0	22.73	1
	MCH	1	0	24	0
		1	49	24.49	0
		1	99	24.6	0
		50	0	23.87	1
		50	25	23.35	1
		50	50	23.48	1
		100	0	23.61	1
	HCH	1	0	24.43	0
		1	49	24.39	0
		1	99	24.43	0
		50	0	23.52	1
		50	25	23.5	1
		50	50	23.46	1
		100	0	23.53	1
16QAM	LCH	1	0	22.46	1

		1	49	22.9	1
		1	99	23.39	1
		50	0	21.46	2
		50	25	21.67	2
		50	50	21.96	2
		100	0	21.72	2
	MCH	1	0	23.32	1
		1	49	23.68	1
		1	99	23.86	1
		50	0	22.23	2
		50	25	22.4	2
		50	50	22.54	2
		100	0	22.31	2
	HCH	1	0	23.63	1
		1	49	23.68	1
		1	99	23.65	1
		50	0	22.54	2
		50	25	22.52	2
		50	50	22.48	2
		100	0	22.53	2

FDD-LTE Band 5:

Channel Bandwidth: 1.4 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.98	0
		1	3	24.05	0
		1	5	23.95	0
		3	0	23.61	0
		3	2	23.56	0
		3	3	23.64	0
		6	0	22.71	1
	MCH	1	0	24.63	0
		1	3	24.63	0
		1	5	24.66	0
		3	0	23.7	0
		3	2	23.68	0
		3	3	23.71	0
		6	0	22.7	1
	HCH	1	0	24.84	0
		1	3	24.79	0
		1	5	24.78	0
		3	0	23.49	0
		3	2	23.53	0
		3	3	23.41	0
		6	0	23.27	1
16QAM	LCH	1	0	23.42	1
		1	3	23.47	1
		1	5	23.34	1
		3	0	23.25	1
		3	2	23.24	1
		3	3	23.28	1
		6	0	22.16	2
	MCH	1	0	23.88	1
		1	3	23.97	1
		1	5	23.95	1
		3	0	23.37	1
		3	2	23.32	1
		3	3	23.37	1
		6	0	22.68	2
	HCH	1	0	23.03	1
		1	3	23.06	1
		1	5	23.99	1

		3	0	23.42	1
		3	2	23.46	1
		3	3	23.48	1
		6	0	22.37	2

Channel Bandwidth: 3 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	24.06	0
		1	7	24.02	0
		1	14	23.99	0
		8	0	23.23	1
		8	4	23.23	1
		8	7	23.26	1
		15	0	23.22	1
	MCH	1	0	24.56	0
		1	7	24.68	0
		1	14	24.71	0
		8	0	23.68	1
		8	4	23.72	1
		8	7	23.76	1
		15	0	23.66	1
	HCH	1	0	24.83	0
		1	7	24.82	0
		1	14	24.68	0
		8	0	23.46	1
		8	4	23.42	1
		8	7	23.4	1
		15	0	23.48	1
16QAM	LCH	1	0	23.37	1
		1	7	23.36	1
		1	14	23.28	1
		8	0	22.35	2
		8	4	22.35	2
		8	7	22.34	2
		15	0	22.27	2
	MCH	1	0	23.91	1
		1	7	23.08	1
		1	14	23.11	1
		8	0	22.7	2
		8	4	22.71	2
		8	7	22.77	2
		15	0	22.68	2

	HCH	1	0	23.01	1
		1	7	23.05	1
		1	14	23.92	1
		8	0	22.85	2
		8	4	22.87	2
		8	7	22.84	2
		15	0	22.87	2

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	24.13	0
		1	12	23.55	0
		1	24	24.12	0
		12	0	22.65	1
		12	6	22.6	1
		12	13	22.88	1
		25	0	22.69	1
	MCH	1	0	24.62	0
		1	12	24.72	0
		1	24	24.22	0
		12	0	23.17	1
		12	6	23.23	1
		12	13	23	1
		25	0	23.16	1
	HCH	1	0	24.91	0
		1	12	24.93	0
		1	24	24.48	0
		12	0	22.98	1
		12	6	22.93	1
		12	13	22.91	1
		25	0	22.87	1
16QAM	LCH	1	0	23.4	1
		1	12	22.87	1
		1	24	23.39	1
		12	0	21.83	2
		12	6	21.79	2
		12	13	22.05	2
		25	0	21.8	2
	MCH	1	0	23.81	1
		1	12	23.02	1
		1	24	23.59	1
		12	0	22.78	2

		12	6	22.85	2
		12	13	22.7	2
		25	0	22.69	2
	HCH	1	0	23.08	1
		1	12	23.05	1
		1	24	23.79	1
		12	0	22.46	2
		12	6	22.41	2
		12	13	22.39	2
		25	0	22.41	2

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.72	0
		1	24	23.76	0
		1	49	24.43	0
		25	0	22.85	1
		25	12	23.11	1
		25	25	23.46	1
		50	0	23.37	1
	MCH	1	0	24.43	0
		1	24	24.99	0
		1	49	23.38	0
		25	0	23.88	1
		25	12	23.68	1
		25	25	23.01	1
		50	0	23.66	1
	HCH	1	0	23.89	0
		1	24	24.89	0
		1	49	24	0
		25	0	23.01	1
		25	12	23.56	1
		25	25	23.87	1
		50	0	23.51	1
16QAM	LCH	1	0	23.11	1
		1	24	23.18	1
		1	49	23.67	1
		25	0	21.96	2
		25	12	22.21	2
		25	25	22.41	2
		50	0	22.37	2
	MCH	1	0	23.71	1

		1	24	23.08	1
		1	49	22.9	1
		25	0	22.58	2
		25	12	22.72	2
		25	25	22.05	2
		50	0	22.72	2
	HCH	1	0	23.21	1
		1	24	23.81	1
		1	49	23.33	1
		25	0	22.11	2
		25	12	22.63	2
		25	25	22.85	2
		50	0	22.59	2

FDD-LTE Band 7:

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.79	0
		1	12	23.83	0
		1	24	24.02	0
		12	0	22.86	1
		12	6	22.82	1
		12	13	22.88	1
		25	0	22.86	1
	MCH	1	0	23.41	0
		1	12	22.78	0
		1	24	23.15	0
		12	0	22.14	1
		12	6	21.94	1
		12	13	22	1
		25	0	22.03	1
	HCH	1	0	23.43	0
		1	12	23.19	0
		1	24	23.42	0
		12	0	21.8	1
		12	6	21.71	1
		12	13	21.89	1
		25	0	21.77	1
16QAM	LCH	1	0	22.93	1
		1	12	22.96	1
		1	24	23.13	1
		12	0	21.91	2
		12	6	21.88	2
		12	13	21.96	2
		25	0	21.87	2
	MCH	1	0	22.53	1
		1	12	22.07	1
		1	24	22.34	1
		12	0	21.38	2
		12	6	21.2	2
		12	13	21.27	2
		25	0	21.19	2
	HCH	1	0	21.83	1
		1	12	21.58	1
		1	24	21.87	1

		12	0	20.8	2
		12	6	20.78	2
		12	13	20.92	2
		25	0	20.85	2

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.41	0
		1	24	23.52	0
		1	49	23.51	0
		25	0	22.72	1
		25	12	22.78	1
		25	25	22.8	1
		50	0	22.78	1
	MCH	1	0	22.8	0
		1	24	23.34	0
		1	49	23.1	0
		25	0	22.53	1
		25	12	22.34	1
		25	25	22.25	1
		50	0	22.33	1
	HCH	1	0	23.26	0
		1	24	23.25	0
		1	49	23.26	0
		25	0	22.14	1
		25	12	21.7	1
		25	25	21.84	1
		50	0	21.74	1
16QAM	LCH	1	0	22.66	1
		1	24	22.84	1
		1	49	22.76	1
		25	0	21.77	2
		25	12	21.82	2
		25	25	21.85	2
		50	0	21.8	2
	MCH	1	0	22.92	1
		1	24	22.53	1
		1	49	22.39	1
		25	0	21.65	2
		25	12	21.48	2
		25	25	21.39	2
		50	0	21.48	2

	HCH	1	0	21.69	1
		1	24	21.69	1
		1	49	21.72	1
		25	0	20.73	2
		25	12	20.79	2
		25	25	20.94	2
		50	0	20.82	2

Channel Bandwidth: 15 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.84	0
		1	37	23.78	0
		1	74	24.13	0
		37	0	23.02	1
		37	18	23.04	1
		37	38	23.2	1
		75	0	23.12	1
	MCH	1	0	23.75	0
		1	37	23	0
		1	74	23.04	0
		37	0	22.51	1
		37	18	22.17	1
		37	38	22.08	1
		75	0	22.27	1
	HCH	1	0	22.84	0
		1	37	23.35	0
		1	74	23.48	0
		37	0	21.78	1
		37	18	21.62	1
		37	38	21.76	1
		75	0	21.73	1
16QAM	LCH	1	0	23.06	1
		1	37	23.16	1
		1	74	23.47	1
		37	0	22.07	2
		37	18	22.09	2
		37	38	22.15	2
		75	0	22.15	2
	MCH	1	0	23.09	1
		1	37	22.33	1
		1	74	22.41	1
		37	0	21.66	2

		37	18	21.36	2
		37	38	21.26	2
		75	0	21.43	2
	HCH	1	0	22.19	1
		1	37	21.73	1
		1	74	21.89	1
		37	0	20.84	2
		37	18	20.69	2
		37	38	20.84	2
		75	0	20.81	2

Channel Bandwidth: 20 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.96	0
		1	49	23.96	0
		1	99	24.2	0
		50	0	22.98	1
		50	25	23.28	1
		50	50	23.18	1
		100	0	23.16	1
	MCH	1	0	24.03	0
		1	49	23.01	0
		1	99	23.11	0
		50	0	22.64	1
		50	25	22.13	1
		50	50	22.14	1
		100	0	22.38	1
	HCH	1	0	24.03	0
		1	49	23.29	0
		1	99	23.42	0
		50	0	22.04	1
		50	25	21.64	1
		50	50	21.69	1
		100	0	21.83	1
16QAM	LCH	1	0	23.14	1
		1	49	23.22	1
		1	99	23.46	1
		50	0	22.02	2
		50	25	22.14	2
		50	50	22.32	2
		100	0	22.18	2
	MCH	1	0	23.33	1

		1	49	22.37	1
		1	99	22.5	1
		50	0	21.71	2
		50	25	21.34	2
		50	50	21.22	2
		100	0	21.41	2
	HCH	1	0	22.43	1
		1	49	21.69	1
		1	99	21.79	1
		50	0	21.07	2
		50	25	20.74	2
		50	50	20.74	2
		100	0	20.86	2

Remark:

1. Per KDB941225 D05 v02r05, 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. Per KDB941225 D05 v02r05, The procedures required for 1 RB allocation in 5.2.1 are applied to measure the SAR for QPSK with 50% RB allocation.
3. Per KDB941225 D05 v02r05, 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. Per KDB941225 D05 v02r05, 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(2.4G) - Maximum Average Power					
Test Mode	**Data Rate**	**Channel**	**Frequency (MHz)**	**Average Power (dBm)**	**Tune-up power (dBm)**
802.11b	1Mbps	CH 01	2412	16.16	16.5
		CH 06	2437	15.47	16.5
		CH 11	2462	15.22	16.5
802.11g	6Mbps	CH 01	2412	12.03	14.0
		CH 06	2437	13.89	14.0
		CH 11	2462	13.58	14.0
802.11n (20MHz)	MCS0	CH 01	2412	11.91	13.5
		CH 06	2437	13.48	13.5
		CH 11	2462	12.76	13.5
802.11n (40MHz)	MCS0	CH 03	2422	13.03	13.5
		CH 06	2437	11.9	13.5
		CH 09	2452	11.92	13.5

WLAN(5.2G)- Maximum Average Power				
Test Mode	**Channel**	**Frequency**	**Average Power**	**Tune-up power**
		(MHz)	**(dBm)**	**(dBm)**
802.11a	CH 36	5180	12.35	12.5
	CH 40	5200	11.53	12.5
	CH 48	5240	12.16	12.5
802.11n-20	CH 36	5180	12.09	12.5
	CH 40	5200	12.19	12.5
	CH 48	5240	11.75	12.5
802.11n -40	CH 38	5190	12.1	12.5
	CH46	5230	12.15	12.5

WLAN(5.8G) - Maximum Average Power				
Test Mode	Channel	Frequency	Average Power	Tune-up power
		(MHz)	(dBm)	(dBm)
802.11a	CH149	5745	11.21	12.5
	CH157	5785	11.81	12.5
	CH165	5825	12.04	12.5
802.11n-20	CH149	5745	10.95	12.0
	CH157	5785	11.49	12.0
	CH165	5825	11.65	12.0
802.11n -40	CH151	5755	11.44	11.5
	CH159	5795	11.36	11.5

Remark:

1. Per KDB 248227 D01 v02r02, For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions.

2. Per KDB 248227 D01 v02r02, For 802.11b DSSS SAR measurements ,when the reported SAR of the highest measured maximum output power channel (see 3.1) for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration. 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.

3 .For OFDM modes (802.11g/n), SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and it is <= 1.2W/kg.

4. Per KDB 248227 D01 v02r02, When multiple channel bandwidth configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined by applying the following steps sequentially.

1) The largest channel bandwidth configuration is selected among the multiple configurations in a frequency band with the same specified maximum output power.

2) If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.

3) If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.

4) When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n.

Bluetooth - Maximum Average Power			
Test Mode	**Data Rate**	**Average Power(dBm)**	**Tune-up power (dBm)**
GFSK	1Mbps	5.427	5.5
Pi/4 QDPSK	2Mbps	4.543	5.5
8DPSK	3Mbps	4.645	5.5

Bluetooth - Maximum Average Power					
Test Mode	**Data Rate**	**Channel**	**Frequency (MHz)**	**Average Power (dBm)**	**Tune-up power (dBm)**
BLE	1Mbps	CH 00	2402	-1.258	-1.0
		CH 19	2440	-1.692	-1.0
		CH 39	2480	-2.23	-1.0

Remark:

Bluetooth maximum output power is 5.427dBm and Maximum Tune-Up output power is 5.5dBm,. 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,16 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

Bluetooth:

Tune-Up Power (dBm)	Max. Power (mW)	Distance (mm)	Frequency (GHz)	Result	Limit
5.5	3.55	5	2.480	1.12	3

The exclusion thresholds is 1.12< 3, therefore, the RF exposure evaluation is not required.

9.2 Test Results for Standalone SAR Test

Head SAR

GSM850 – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
1.	GSM	Right Cheek	251	848.8	32.48	32.5	1.005	0.218	0.219
2.	GSM	Right Tilted	251	848.8	32.48	32.5	1.005	0.141	0.142
3.	GSM	Left Cheek	251	848.8	32.48	32.5	1.005	0.222	0.223
4.	GSM	Left Tilted	251	848.8	32.48	32.5	1.005	0.150	0.151

GSM1900 – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	M Hz					
5.	GSM	Right Cheek	661	1880.0	29.90	30.00	1.023	0.297	0.304
6.	GSM	Right Tilted	661	1880.0	29.90	30.00	1.023	0.188	0.192
7.	GSM	Left Cheek	661	1880.0	29.90	30.00	1.023	0.296	0.303
8.	GSM	Left Tilted	661	1880.0	29.90	30.00	1.023	0.186	0.190

WCDMA Band 2 – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
9.	RMC	Right Cheek	9262	1852.4	23.26	23.5	1.057	0.625	0.661
10.	RMC	Right Tilted	9262	1852.4	23.26	23.5	1.057	0.311	0.329
11.	RMC	Left Cheek	9262	1852.4	23.26	23.5	1.057	0.567	0.599
12.	RMC	Left Tilted	9262	1852.4	23.26	23.5	1.057	0.308	0.325

WCDMA Band 5 – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
13.	RMC	Right Cheek	4183	836.4	23.69	24.0	1.074	0.178	0.191
14.	RMC	Right Tilted	4183	836.4	23.69	24.0	1.074	0.108	0.116
15.	RMC	Left Cheek	4183	836.4	23.69	24.0	1.074	0.169	0.182
16.	RMC	Left Tilted	4183	836.4	23.69	24.0	1.074	0.098	0.105

LTE Band 4– Head SAR Test								
Plot No.	Mode	Test Position Head	Frequency	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
	Modulation, Bandwidth, RB		MHz					
17.	QPSK 20MHz 1RB	Right Cheek	1732.5	24.6	25.0	1.096	0.353	0.387
18.	QPSK 20MHz 1RB	Right Tilted	1732.5	24.6	25.0	1.096	0.189	0.207
19.	QPSK 20MHz 1RB	Left Cheek	1732.5	24.6	25.0	1.096	0.309	0.339
20.	QPSK 20MHz 1RB	Left Tilted	1732.5	24.6	25.0	1.096	0.167	0.183
21.	QPSK 20MHz 50%RB	Right Cheek	1732.5	23.87	24.0	1.030	0.189	0.195
22.	QPSK 20MHz 50%RB	Right Tilted	1732.5	23.87	24.0	1.030	0.098	0.101
23.	QPSK 20MHz 50%RB	Left Cheek	1732.5	23.87	24.0	1.030	0.153	0.158
24.	QPSK 20MHz 50%RB	Left Tilted	1732.5	23.87	24.0	1.030	0.087	0.090

LTE Band 5– Head SAR Test								
Plot No.	Mode	Test Position Head	Frequency	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
	Modulation, Bandwidth		MHz					
25.	QPSK 10MHz 1RB	Right Cheek	836.5	24.99	25.0	1.002	0.171	0.171
26.	QPSK 10MHz 1RB	Right Tilted	836.5	24.99	25.0	1.002	0.101	0.101
27.	QPSK 10MHz 1RB	Left Cheek	836.5	24.99	25.0	1.002	0.169	0.169
28.	QPSK 10MHz 1RB	Left Tilted	836.5	24.99	25.0	1.002	0.099	0.099
29.	QPSK 10MHz 50%RB	Right Cheek	836.5	23.88	24.0	1.028	0.081	0.083
30.	QPSK 10MHz 50%RB	Right Tilted	836.5	23.88	24.0	1.028	0.055	0.057
31.	QPSK 10MHz 50%RB	Left Cheek	836.5	23.88	24.0	1.028	0.089	0.091
32.	QPSK 10MHz 50%RB	Left Tilted	836.5	23.88	24.0	1.028	0.051	0.052

LTE Band 7– Head SAR Test								
Plot No.	Mode	Test Position Head	Frequency	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
	Modulation, Bandwidth		MHz					
33.	QPSK 20MHz 1RB	Right Cheek	2510.0	24.2	24.5	1.072	0.093	0.100
34.	QPSK 20MHz 1RB	Right Tilted	2510.0	24.2	24.5	1.072	0.056	0.060
35.	QPSK 20MHz 1RB	Left Cheek	2510.0	24.2	24.5	1.072	0.067	0.072
36.	QPSK 20MHz 1RB	Left Tilted	2510.0	24.2	24.5	1.072	0.038	0.041
37.	QPSK 20MHz 50%RB	Right Cheek	2510.0	23.28	23.5	1.052	0.051	0.054
38.	QPSK 20MHz 50%RB	Right Tilted	2510.0	23.28	23.5	1.052	0.032	0.034
39.	QPSK 20MHz 50%RB	Left Cheek	2510.0	23.28	23.5	1.052	0.036	0.038
40.	QPSK 20MHz 50%RB	Left Tilted	2510.0	23.28	23.5	1.052	0.019	0.020

WLAN 2.4GHz – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
41.	802.11b	Right Cheek	01	2412	16.16	16.5	1.081	0.103	0.111
42.	802.11b	Right Tilted	01	2412	16.16	16.5	1.081	0.056	0.061
43.	802.11b	Left Cheek	01	2412	16.16	16.5	1.081	0.203	0.220
44.	802.11b	Left Tilted	01	2412	16.16	16.5	1.081	0.013	0.014

WLAN 5.2GHz – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
45.	11n.n40	Right Cheek	46	5230	12.15	12.5	1.084	0.128	0.139
46.	11n.n40	Right Tilted	46	5230	12.15	12.5	1.084	0.067	0.073
47.	11n.n40	Left Cheek	46	5230	12.15	12.5	1.084	0.204	0.221
48.	11n.n40	Left Tilted	46	5230	12.15	12.5	1.084	0.112	0.121

WLAN 5.8GHz – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
49.	802.11a	Right Cheek	165	5825	12.04	12.5	1.112	0.141	0.157
50.	802.11a	Right Tilted	165	5825	12.04	12.5	1.112	0.074	0.082
51.	802.11a	Left Cheek	165	5825	12.04	12.5	1.112	0.277	0.308
52.	802.11a	Left Tilted	165	5825	12.04	12.5	1.112	0.153	0.170

Remark: 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.

Body SAR

GSM850 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
53.	GSM	Back	251	848.8	32.48	32.50	1.005	0.310	0.311
54.	GSM	Front	251	848.8	32.48	32.50	1.005	0.205	0.206
55.	GPRS_2TX	Back Side	251	848.8	31.32	31.50	1.042	0.655	0.683
56.	GPRS_2TX	Front Side	251	848.8	31.32	31.50	1.042	0.445	0.464
57.	GPRS_2TX	Right side	251	848.8	31.32	31.50	1.042	0.113	0.118
58.	GPRS_2TX	Left side	251	848.8	31.32	31.50	1.042	0.108	0.113
59.	GPRS_2TX	Bottom side	251	848.8	31.32	31.50	1.042	0.044	0.046

GSM1900 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
60.	GSM	Back	661	1880.0	29.90	30.00	1.023	0.469	0.480
61.	GSM	Front	661	1880.0	29.90	30.00	1.023	0.276	0.282
62.	GPRS_2TX	Back Side	661	1880.0	28.89	29.00	1.026	0.876	0.898
63.	GPRS_2TX	Back Side	512	1850.2	28.81	29.00	1.045	0.849	0.887
64.	GPRS_2TX	Back Side	810	1909.8	28.88	29.00	1.028	0.794	0.816
65.	GPRS_2TX	Front Side	661	1880.0	28.89	29.00	1.026	0.423	0.434
66.	GPRS_2TX	Right side	661	1880.0	28.89	29.00	1.026	0.213	0.218
67.	GPRS_2TX	Left side	661	1880.0	28.89	29.00	1.026	0.201	0.206
68.	GPRS_2TX	Bottom side	661	1880.0	28.89	29.00	1.026	0.393	0.403

WCDMA Band 2 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
69.	RMC 12.2k	Back Side	9262	1852.4	23.26	23.5	1.057	0.987	1.043
70.	RMC 12.2k	Back Side	9400	1880.0	23.01	23.5	1.119	0.852	0.954
71.	RMC 12.2k	Back Side	9538	1907.6	22.63	23.5	1.222	0.756	0.924
72.	RMC 12.2k	Front Face	9262	1852.4	23.26	23.5	1.057	0.657	0.694
73.	RMC 12.2k	Right Side	9262	1852.4	23.26	23.5	1.057	0.257	0.272
74.	RMC 12.2k	Left side	9262	1852.4	23.26	23.5	1.057	0.244	0.258
75.	RMC 12.2k	Bottom Side	9262	1852.4	23.26	23.5	1.057	0.500	0.528

WCDMA Band 5 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
76.	RMC 12.2k	Back Side	4183	836.4	23.69	24.0	1.074	0.359	0.386
77.	RMC 12.2k	Front Side	4183	836.4	23.69	24.0	1.074	0.217	0.233
78.	RMC 12.2k	Right side	4183	836.4	23.69	24.0	1.074	0.120	0.129
79.	RMC 12.2k	Left side	4183	836.4	23.69	24.0	1.074	0.113	0.121
80.	RMC 12.2k	Bottom side	4183	836.4	23.69	24.0	1.074	0.024	0.026

LTE Band 4–Body SAR Test (Gap: 10mm)								
Plot No.	Mode	Test Position Body	Frequency	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
	Modulation, Bandwidth, RB		MHz					
81.	QPSK 20MHz 1RB	Back Side	1732.5	24.6	25.0	1.096	0.650	0.713
82.	QPSK 20MHz 1RB	Front Side	1732.5	24.6	25.0	1.096	0.522	0.572
83.	QPSK 20MHz 1RB	Right side	1732.5	24.6	25.0	1.096	0.172	0.189
84.	QPSK 20MHz 1RB	Left side	1732.5	24.6	25.0	1.096	0.162	0.178
85.	QPSK 20MHz 1RB	Bottom side	1732.5	24.6	25.0	1.096	0.342	0.375
86.	QPSK 20MHz 50%RB	Back Side	1732.5	23.87	24.0	1.030	0.355	0.366
87.	QPSK 20MHz 50%RB	Front Side	1732.5	23.87	24.0	1.030	0.287	0.296
88.	QPSK 20MHz 50%RB	Right side	1732.5	23.87	24.0	1.030	0.108	0.111
89.	QPSK 20MHz 50%RB	Left side	1732.5	23.87	24.0	1.030	0.101	0.104
90.	QPSK 20MHz 50%RB	Bottom side	1732.5	23.87	24.0	1.030	0.188	0.194

LTE Band 5–Body SAR Test (Gap: 10mm)								
Plot No.	Mode	Test Position Body	Frequency	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
	Modulation, Bandwidth, RB		MHz					
91.	QPSK 10MHz 1RB	Back Side	836.5	24.99	25.0	1.002	0.352	0.353
92.	QPSK 10MHz 1RB	Front Side	836.5	24.99	25.0	1.002	0.211	0.211
93.	QPSK 10MHz 1RB	Right side	836.5	24.99	25.0	1.002	0.111	0.111
94.	QPSK 10MHz 1RB	Left side	836.5	24.99	25.0	1.002	0.103	0.103
95.	QPSK 10MHz 1RB	Bottom side	836.5	24.99	25.0	1.002	0.023	0.023
96.	QPSK 10MHz 50%RB	Back Side	836.5	23.88	24.0	1.028	0.188	0.193
97.	QPSK 10MHz 50%RB	Front Side	836.5	23.88	24.0	1.028	0.107	0.110
98.	QPSK 10MHz 50%RB	Right side	836.5	23.88	24.0	1.028	0.066	0.068
99.	QPSK 10MHz 50%RB	Left side	836.5	23.88	24.0	1.028	0.061	0.063
100.	QPSK 10MHz 50%RB	Bottom side	836.5	23.88	24.0	1.028	0.013	0.013

LTE Band 7–Body SAR Test (Gap: 10mm)								
Plot No.	Mode	Test Position Body	Frequency	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
	Modulation, Bandwidth, RB		MHz					
101.	QPSK 20MHz 1RB	Back Side	2510.0	24.2	24.5	1.072	0.922	0.988
102.	QPSK 20MHz 1RB	Back Side	2535.0	24.03	24.5	1.114	0.790	0.880
103.	QPSK 20MHz 1RB	Back Side	2560.0	24.03	24.5	1.114	0.840	0.936
104.	QPSK 20MHz 1RB	Front Side	2510.0	24.2	24.5	1.072	0.13	0.139
105.	QPSK 20MHz 1RB	Right side	2510.0	24.2	24.5	1.072	0.109	0.117
106.	QPSK 20MHz 1RB	Left side	2510.0	24.2	24.5	1.072	0.103	0.110
107.	QPSK 20MHz 1RB	Bottom side	2510.0	24.2	24.5	1.072	0.379	0.406
108.	QPSK 20MHz 50%RB	Back Side	2510.0	23.28	23.5	1.052	0.517	0.544
109.	QPSK 20MHz 50%RB	Front Side	2510.0	23.28	23.5	1.052	0.068	0.072
110.	QPSK 20MHz 50%RB	Right side	2510.0	23.28	23.5	1.052	0.051	0.054
111.	QPSK 20MHz 50%RB	Left side	2510.0	23.28	23.5	1.052	0.048	0.050
112.	QPSK 20MHz 50%RB	Bottom side	2510.0	23.28	23.5	1.052	0.187	0.197
113.	QPSK 20MHz 100%RB	Back Side	2510.0	23.16	23.5	1.081	0.473	0.512

WLAN 2.4GHz –Body SAR Test									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
114.	802.11b	Back Side	01	2412	16.16	16.5	1.081	0.108	0.117
115.	802.11b	Front Side	01	2412	16.16	16.5	1.081	0.039	0.042
116.	802.11b	Right side	01	2412	16.16	16.5	1.081	0.050	0.054
117.	802.11b	Top side	01	2412	16.16	16.5	1.081	0.014	0.015

WLAN 5.2GHz –Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR10g (W/kg)	Scaled SAR10g (W/kg)
			CH.	MHz					
118.	11n.n40	Back Side	46	5230	12.15	12.5	1.084	0.047	0.051
119.	11n.n40	Front Side	46	5230	12.15	12.5	1.084	0.042	0.046
120.	11n.n40	Right side	46	5230	12.15	12.5	1.084	0.114	0.124
121.	11n.n40	Top side	46	5230	12.15	12.5	1.084	0.079	0.086

WLAN 5.8GHz –Body SAR Test									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR10g (W/kg)	Scaled SAR10g (W/kg)
			CH.	MHz					
122.	802.11	Back Side	165	5825	12.04	12.5	1.112	0.119	0.132
123.	802.11a	Front Side	165	5825	12.04	12.5	1.112	0.079	0.088
124.	802.11a	Right side	165	5825	12.04	12.5	1.112	0.165	0.183
125.	802.11a	Top side	165	5825	12.04	12.5	1.112	0.099	0.110

Remark: 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.

Repeated SAR

GSM1900 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
126.	GPRS_2TX	Back Side	661	1880.0	28.89	29.00	1.026	0.869	0.891

WCDMA Band 2 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
127.	RMC 12.2k	Back Side	9262	1852.4	23.26	23.5	1.057	0.981	1.037

LTE Band 7–Body SAR Test (Gap: 10mm)								
Plot No.	Mode	Test Position Body	Frequency	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
	Modulation, Bandwidth, RB		MHz					
128.	RMC QPSK 20MHz 1RB	Back Side	2510.0	24.2	24.5	1.072	0.919	0.985

Remark:

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.

9.3 Simultaneous Multi-band Transmission SAR Analysis

List of Mode for Simultaneous Multi-band Transmission

No.	Configurations	Head SAR	Body SAR
1	GSM(Voice/Data) + WLAN(2.4G)(Data)	Yes	Yes
2	WCDMA (Voice/Data)+ (2.4G)(Data)	Yes	Yes
3	LTE(Data) + (2.4G)(Data)	Yes	Yes
4	GSM(Voice/Data) + WLAN(5G)(Data)	Yes	Yes
5	WCDMA (Voice/Data)+ (5G)(Data)	Yes	Yes
6	LTE(Data) + (5G)(Data)	Yes	Yes
7	GSM(Voice/Data) + Bluetooth(Data)	Yes	Yes
8	WCDMA (Voice/Data) + Bluetooth(Data)	Yes	Yes
9	LTE(Data) + Bluetooth(Data)	Yes	Yes

Remark:

1. GSM ,WCDMA and LTE 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:

Bluetooth:

Tune-Up Power (dBm)	Max. Power (mW)	Distance (mm)	Frequency (GHz)	X	SAR(1g) 5mm	SAR(1g) 10mm
5.5	3.55	5/10	2.480	7.5	0.149	0.075

4. The maximum SAR summation is calculated based on the same configuration and test position.

Head SAR

WWAN and WLAN

	WWAN		WLAN(2.4G)	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Right Cheek	GSM850	0.219	0.111	0.33
Right Tilted	GSM850	0.142	0.061	0.203
Left Cheek	GSM850	0.223	0.220	0.443
Left Tilted	GSM850	0.151	0.014	0.165
Right Cheek	GSM1900	0.304	0.111	0.415
Right Tilted	GSM1900	0.192	0.061	0.253
Left Cheek	GSM1900	0.303	0.220	0.523
Left Tilted	GSM1900	0.190	0.014	0.204
Right Cheek	WCDMA Band 2	0.661	0.111	0.772
Right Tilted	WCDMA Band 2	0.329	0.061	0.39
Left Cheek	WCDMA Band 2	0.599	0.220	**0.819**
Left Tilted	WCDMA Band 2	0.325	0.014	0.339
Right Cheek	WCDMA Band 5	0.191	0.111	0.302
Right Tilted	WCDMA Band 5	0.116	0.061	0.177
Left Cheek	WCDMA Band 5	0.182	0.220	0.402
Left Tilted	WCDMA Band 5	0.105	0.014	0.119
Right Cheek	LTE Band 4	0.387	0.111	0.498
Right Tilted	LTE Band 4	0.207	0.061	0.268
Left Cheek	LTE Band 4	0.339	0.220	0.559
Left Tilted	LTE Band 4	0.183	0.014	0.197
Right Cheek	LTE Band 5	0.171	0.111	0.282
Right Tilted	LTE Band 5	0.101	0.061	0.162
Left Cheek	LTE Band 5	0.169	0.220	0.389
Left Tilted	LTE Band 5	0.099	0.014	0.113
Right Cheek	LTE Band 7	0.100	0.111	0.211
Right Tilted	LTE Band 7	0.060	0.061	0.121
Left Cheek	LTE Band 7	0.072	0.220	0.292
Left Tilted	LTE Band 7	0.041	0.014	0.055

Position	WWAN		WLAN(5.2G)	Summed SAR (W/kg)
	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Right Cheek	GSM850	0.219	0.139	0.358
Right Tilted	GSM850	0.142	0.073	0.215
Left Cheek	GSM850	0.223	0.221	0.444
Left Tilted	GSM850	0.151	0.121	0.272
Right Cheek	GSM1900	0.304	0.139	0.443
Right Tilted	GSM1900	0.192	0.073	0.265
Left Cheek	GSM1900	0.303	0.221	0.524
Left Tilted	GSM1900	0.190	0.121	0.311
Right Cheek	WCDMA Band 2	0.661	0.139	0.8
Right Tilted	WCDMA Band 2	0.329	0.073	0.402
Left Cheek	WCDMA Band 2	0.599	0.221	**0.82**
Left Tilted	WCDMA Band 2	0.325	0.121	0.446
Right Cheek	WCDMA Band 5	0.191	0.139	0.33
Right Tilted	WCDMA Band 5	0.116	0.073	0.189
Left Cheek	WCDMA Band 5	0.182	0.221	0.403
Left Tilted	WCDMA Band 5	0.105	0.121	0.226
Right Cheek	LTE Band 4	0.387	0.139	0.526
Right Tilted	LTE Band 4	0.207	0.073	0.28
Left Cheek	LTE Band 4	0.339	0.221	0.56
Left Tilted	LTE Band 4	0.183	0.121	0.304
Right Cheek	LTE Band 5	0.171	0.139	0.31
Right Tilted	LTE Band 5	0.101	0.073	0.174
Left Cheek	LTE Band 5	0.169	0.221	0.39
Left Tilted	LTE Band 5	0.099	0.121	0.22
Right Cheek	LTE Band 7	0.100	0.139	0.239
Right Tilted	LTE Band 7	0.060	0.073	0.133
Left Cheek	LTE Band 7	0.072	0.221	0.293
Left Tilted	LTE Band 7	0.041	0.121	0.162

Position	WWAN		WLAN(5.8G)	Summed SAR (W/kg)
	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Right Cheek	GSM850	0.219	0.157	0.376
Right Tilted	GSM850	0.142	0.082	0.224
Left Cheek	GSM850	0.223	0.308	0.531
Left Tilted	GSM850	0.151	0.170	0.321
Right Cheek	GSM1900	0.304	0.157	0.461
Right Tilted	GSM1900	0.192	0.082	0.274
Left Cheek	GSM1900	0.303	0.308	0.611
Left Tilted	GSM1900	0.190	0.170	0.36
Right Cheek	WCDMA Band 2	0.661	0.157	0.818
Right Tilted	WCDMA Band 2	0.329	0.082	0.411
Left Cheek	WCDMA Band 2	0.599	0.308	**0.907**
Left Tilted	WCDMA Band 2	0.325	0.170	0.495
Right Cheek	WCDMA Band 5	0.191	0.157	0.348
Right Tilted	WCDMA Band 5	0.116	0.082	0.198
Left Cheek	WCDMA Band 5	0.182	0.308	0.49
Left Tilted	WCDMA Band 5	0.105	0.170	0.275
Right Cheek	LTE Band 4	0.387	0.157	0.544
Right Tilted	LTE Band 4	0.207	0.082	0.289
Left Cheek	LTE Band 4	0.339	0.308	0.647
Left Tilted	LTE Band 4	0.183	0.170	0.353
Right Cheek	LTE Band 5	0.171	0.157	0.328
Right Tilted	LTE Band 5	0.101	0.082	0.183
Left Cheek	LTE Band 5	0.169	0.308	0.477
Left Tilted	LTE Band 5	0.099	0.170	0.269
Right Cheek	LTE Band 7	0.100	0.157	0.257
Right Tilted	LTE Band 7	0.060	0.082	0.142
Left Cheek	LTE Band 7	0.072	0.308	0.38
Left Tilted	LTE Band 7	0.041	0.170	0.211

WWAN and Bluetooth

	WWAN		Bluetooth	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Right Cheek	GSM850	0.219	0.149	0.368
Right Tilted	GSM850	0.142	0.149	0.291
Left Cheek	GSM850	0.223	0.149	0.372
Left Tilted	GSM850	0.151	0.149	0.3
Right Cheek	GSM1900	0.304	0.149	0.453
Right Tilted	GSM1900	0.192	0.149	0.341
Left Cheek	GSM1900	0.303	0.149	0.452
Left Tilted	GSM1900	0.190	0.149	0.339
Right Cheek	WCDMA Band 2	0.661	0.149	**0.81**
Right Tilted	WCDMA Band 2	0.329	0.149	0.478
Left Cheek	WCDMA Band 2	0.599	0.149	0.748
Left Tilted	WCDMA Band 2	0.325	0.149	0.474
Right Cheek	WCDMA Band 5	0.191	0.149	0.34
Right Tilted	WCDMA Band 5	0.116	0.149	0.265
Left Cheek	WCDMA Band 5	0.182	0.149	0.331
Left Tilted	WCDMA Band 5	0.105	0.149	0.254
Right Cheek	LTE Band 4	0.387	0.149	0.536
Right Tilted	LTE Band 4	0.207	0.149	0.356
Left Cheek	LTE Band 4	0.339	0.149	0.488
Left Tilted	LTE Band 4	0.183	0.149	0.332
Right Cheek	LTE Band 5	0.171	0.149	0.32
Right Tilted	LTE Band 5	0.101	0.149	0.25
Left Cheek	LTE Band 5	0.169	0.149	0.318
Left Tilted	LTE Band 5	0.099	0.149	0.248
Right Cheek	LTE Band 7	0.100	0.149	0.249
Right Tilted	LTE Band 7	0.060	0.149	0.209
Left Cheek	LTE Band 7	0.072	0.149	0.221
Left Tilted	LTE Band 7	0.041	0.149	0.19

Body SAR

WWAN and WLAN

	WWAN		WLAN(2.4G)	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	GSM850	0.683	0.117	0.8
Front	GSM850	0.464	0.042	0.506
Top side	GSM850	--	0.015	0.015
Bottom side	GSM850	0.046	--	0.046
Right side	GSM850	0.118	0.054	0.172
Left side	GSM850	0.113	--	0.113
Back	GSM1900	0.898	0.117	1.015
Front	GSM1900	0.434	0.042	0.476
Top side	GSM1900	--	0.015	0.015
Bottom side	GSM1900	0.403	--	0.403
Right side	GSM1900	0.218	0.054	0.272
Left side	GSM1900	0.206	--	0.206
Back	WCDMA Band 2	1.043	0.117	**1.16**
Front	WCDMA Band 2	0.694	0.042	0.736
Top side	WCDMA Band 2	--	0.015	0.015
Bottom side	WCDMA Band 2	0.528	--	0.528
Right side	WCDMA Band 2	0.272	0.054	0.326
Left side	WCDMA Band 2	0.258	--	0.258
Back	WCDMA Band 5	0.386	0.117	0.503
Front	WCDMA Band 5	0.233	0.042	0.275
Top side	WCDMA Band 5	--	0.015	0.015
Bottom side	WCDMA Band 5	0.026	--	0.026
Right side	WCDMA Band 5	0.129	0.054	0.183
Left side	WCDMA Band 5	0.121	--	0.121
Back	LTE Band 4	0.713	0.117	0.83
Front	LTE Band 4	0.572	0.042	0.614
Top side	LTE Band 4	--	0.015	0.015
Bottom side	LTE Band 4	0.375	--	0.375
Right side	LTE Band 4	0.189	0.054	0.243
Left side	LTE Band 4	0.178	--	0.178
Back	LTE Band 5	0.353	0.117	0.47
Front	LTE Band 5	0.211	0.042	0.253
Top side	LTE Band 5	--	0.015	0.015
Bottom side	LTE Band 5	0.023	--	0.023
Right side	LTE Band 5	0.111	0.054	0.165
Left side	LTE Band 5	0.103	--	0.103
Back	LTE Band 7	0.988	0.117	1.105

Front	LTE Band 7	0.139	0.042	0.181
Top side	LTE Band 7	--	0.015	0.015
Bottom side	LTE Band 7	0.406	--	0.406
Right side	LTE Band 7	0.117	0.054	0.171
Left side	LTE Band 7	0.110	--	0.110

	WWAN		WLAN(5.2G)	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	GSM850	0.683	0.051	0.734
Front	GSM850	0.464	0.046	0.51
Top side	GSM850	--	0.086	0.086
Bottom side	GSM850	0.046	--	0.046
Right side	GSM850	0.118	0.124	0.242
Left side	GSM850	0.113	--	0.113
Back	GSM1900	0.898	0.051	0.949
Front	GSM1900	0.434	0.046	0.48
Top side	GSM1900	--	0.086	0.086
Bottom side	GSM1900	0.403	--	0.403
Right side	GSM1900	0.218	0.124	0.342
Left side	GSM1900	0.206	--	0.206
Back	WCDMA Band 2	1.043	0.051	**1.094**
Front	WCDMA Band 2	0.694	0.046	0.74
Top side	WCDMA Band 2	--	0.086	0.086
Bottom side	WCDMA Band 2	0.528	--	0.528
Right side	WCDMA Band 2	0.272	0.124	0.396
Left side	WCDMA Band 2	0.258	--	0.258
Back	WCDMA Band 5	0.386	0.051	0.437
Front	WCDMA Band 5	0.233	0.046	0.279
Top side	WCDMA Band 5	--	0.086	0.086
Bottom side	WCDMA Band 5	0.026	--	0.026
Right side	WCDMA Band 5	0.129	0.124	0.253
Left side	WCDMA Band 5	0.121	--	0.121
Back	LTE Band 4	0.713	0.051	0.764
Front	LTE Band 4	0.572	0.046	0.618
Top side	LTE Band 4	--	0.086	0.086
Bottom side	LTE Band 4	0.375	--	0.375
Right side	LTE Band 4	0.189	0.124	0.313
Left side	LTE Band 4	0.178	--	0.178
Back	LTE Band 5	0.353	0.051	0.404
Front	LTE Band 5	0.211	0.046	0.257
Top side	LTE Band 5	--	0.086	0.086
Bottom side	LTE Band 5	0.023	--	0.023

Right side	LTE Band 5	0.111	0.124	0.235
Left side	LTE Band 5	0.103	--	0.103
Back	LTE Band 7	0.988	0.051	1.039
Front	LTE Band 7	0.139	0.046	0.185
Top side	LTE Band 7	--	0.086	0.086
Bottom side	LTE Band 7	0.406	--	0.406
Right side	LTE Band 7	0.117	0.124	0.241
Left side	LTE Band 7	0.110	--	0.110

	WWAN		WLAN(5.8G)	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	GSM850	0.683	0.132	0.815
Front	GSM850	0.464	0.088	0.552
Top side	GSM850	--	0.110	0.110
Bottom side	GSM850	0.046	--	0.046
Right side	GSM850	0.118	0.183	0.301
Left side	GSM850	0.113	--	0.113
Back	GSM1900	0.898	0.132	1.03
Front	GSM1900	0.434	0.088	0.522
Top side	GSM1900	--	0.110	0.110
Bottom side	GSM1900	0.403	--	0.403
Right side	GSM1900	0.218	0.183	0.401
Left side	GSM1900	0.206	--	0.206
Back	WCDMA Band 2	1.043	0.132	**1.175**
Front	WCDMA Band 2	0.694	0.088	0.782
Top side	WCDMA Band 2	--	0.110	0.110
Bottom side	WCDMA Band 2	0.528	--	0.528
Right side	WCDMA Band 2	0.272	0.183	0.455
Left side	WCDMA Band 2	0.258	--	0.258
Back	WCDMA Band 5	0.386	0.132	0.518
Front	WCDMA Band 5	0.233	0.088	0.321
Top side	WCDMA Band 5	--	0.110	0.110
Bottom side	WCDMA Band 5	0.026	--	0.026
Right side	WCDMA Band 5	0.129	0.183	0.312
Left side	WCDMA Band 5	0.121	--	0.121
Back	LTE Band 4	0.713	0.132	0.845
Front	LTE Band 4	0.572	0.088	0.66
Top side	LTE Band 4	--	0.110	0.110
Bottom side	LTE Band 4	0.375	--	0.375
Right side	LTE Band 4	0.189	0.183	0.372
Left side	LTE Band 4	0.178	--	0.178

Back	LTE Band 5	0.353	0.132	0.485
Front	LTE Band 5	0.211	0.088	0.299
Top side	LTE Band 5	--	0.110	0.110
Bottom side	LTE Band 5	0.023	--	0.023
Right side	LTE Band 5	0.111	0.183	0.294
Left side	LTE Band 5	0.103	--	0.103
Back	LTE Band 7	0.988	0.132	1.12
Front	LTE Band 7	0.139	0.088	0.227
Top side	LTE Band 7	--	0.110	0.110
Bottom side	LTE Band 7	0.406	--	0.406
Right side	LTE Band 7	0.117	0.183	0.3
Left side	LTE Band 7	0.110	--	0.110

WWAN and Bluetooth

	WWAN		Bluetooth	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	GSM850	0.683	0.075	0.758
Front	GSM850	0.464	0.075	0.539
Top side	GSM850	--	0.075	0.075
Bottom side	GSM850	0.046	0.075	0.121
Right side	GSM850	0.118	0.075	0.193
Left side	GSM850	0.113	0.075	0.188
Back	GSM1900	0.898	0.075	0.973
Front	GSM1900	0.434	0.075	0.509
Top side	GSM1900	--	0.075	0.075
Bottom side	GSM1900	0.403	0.075	0.478
Right side	GSM1900	0.218	0.075	0.293
Left side	GSM1900	0.206	0.075	0.281
Back	WCDMA Band 2	1.043	0.075	**1.118**
Front	WCDMA Band 2	0.694	0.075	0.769
Top side	WCDMA Band 2	--	0.075	0.075
Bottom side	WCDMA Band 2	0.528	0.075	0.603
Right side	WCDMA Band 2	0.272	0.075	0.347
Left side	WCDMA Band 2	0.258	0.075	0.333
Back	WCDMA Band 5	0.386	0.075	0.461
Front	WCDMA Band 5	0.233	0.075	0.308
Top side	WCDMA Band 5	--	0.075	0.075
Bottom side	WCDMA Band 5	0.026	0.075	0.101
Right side	WCDMA Band 5	0.129	0.075	0.204
Left side	WCDMA Band 5	0.121	0.075	0.196
Back	LTE Band 4	0.713	0.075	0.788
Front	LTE Band 4	0.572	0.075	0.647

Top side	LTE Band 4	--	0.075	0.075
Bottom side	LTE Band 4	0.375	0.075	0.45
Right side	LTE Band 4	0.189	0.075	0.264
Left side	LTE Band 4	0.178	0.075	0.253
Back	LTE Band 5	0.353	0.075	0.428
Front	LTE Band 5	0.211	0.075	0.286
Top side	LTE Band 5	--	0.075	0.075
Bottom side	LTE Band 5	0.023	0.075	0.098
Right side	LTE Band 5	0.111	0.075	0.186
Left side	LTE Band 5	0.103	0.075	0.178
Back	LTE Band 7	0.988	0.075	1.063
Front	LTE Band 7	0.139	0.075	0.214
Top side	LTE Band 7	--	0.075	0.075
Bottom side	LTE Band 7	0.406	0.075	0.481
Right side	LTE Band 7	0.117	0.075	0.192
Left side	LTE Band 7	0.110	0.075	0.185

10. Measurement Uncertainty

10.1 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	E.3.2	5.00	R	√3	0.64	0.43	1.85	1.24	∝

from target value									
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	1	0.64	0.43	3.20	2.15	∝
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	∝
Combined Standard Uncertainty			RSS				12.98	12.53	
Expanded Uncertainty (95% Confidence interval)			K=2				25.32	24.43	

10.2 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.	E.5.2	5.0	R	√3	1	1	2.89	2.89	∝

SAR Evaluation									
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 - measurement uncertainty	E.3.3	5.00	N	1	0.64	0.43	3.20	2.15	
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	

Annex A. Plots of System Performance Check

MEASUREMENT 1

For Head Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 04/15/2019

Measurement duration: 7 minutes 21 seconds

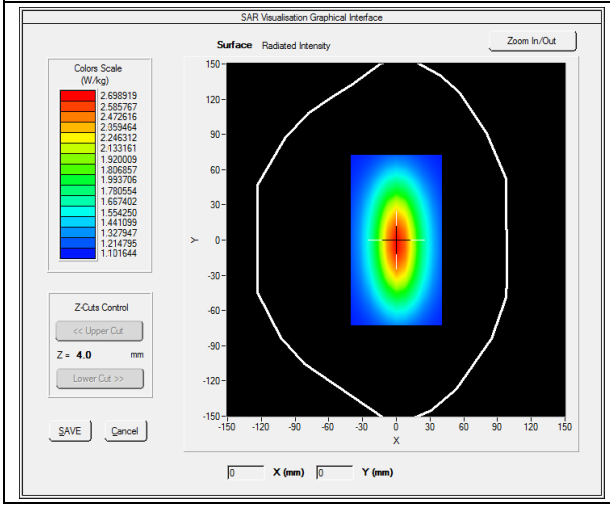
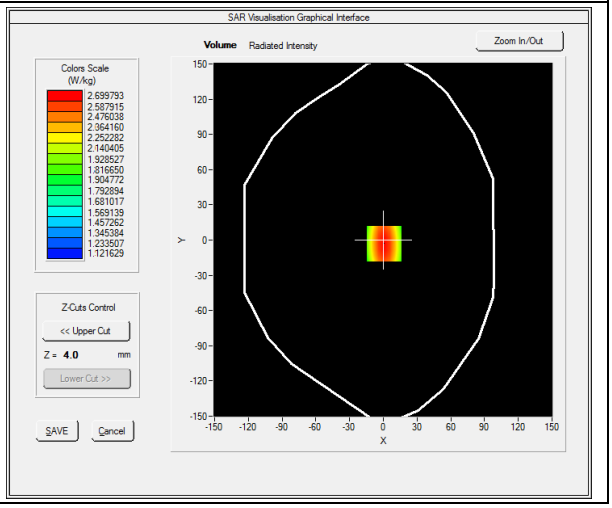
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.93; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW835
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	835.000000
Relative Permittivity (real part)	41.110245
Conductivity (S/m)	0.871245
Power Variation (%)	0.038437
Ambient Temperature	21.1
Liquid Temperature	21.3

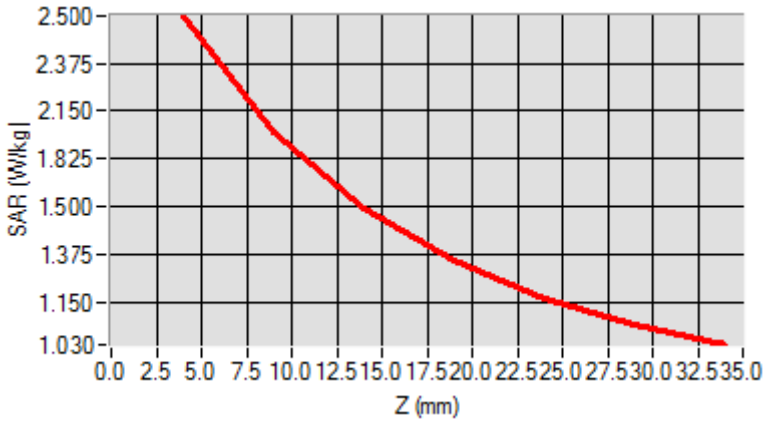
SURFACE SAR	VOLUME SAR
	

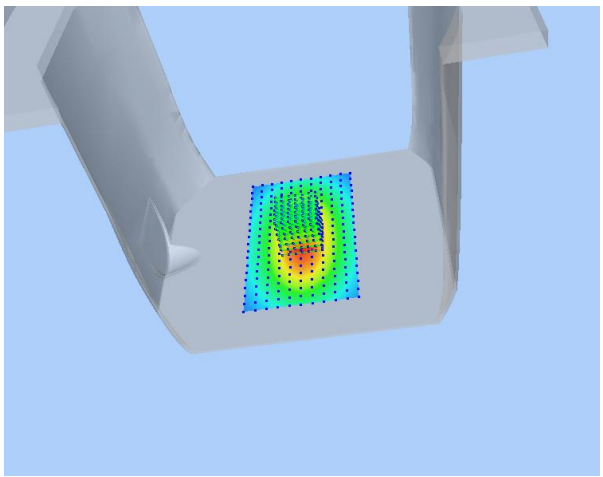
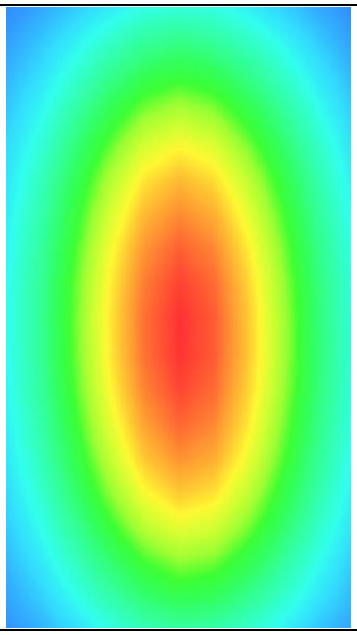
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	1.519489
SAR 1g (W/Kg)	2.411253

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	2.4900	1.8942	1.4811	1.3541	1.1123	1.0539



3D screen shot	Hot spot position
	

MEASUREMENT 2

For Head Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 04/16/2019

Measurement duration: 12 minutes 21 seconds

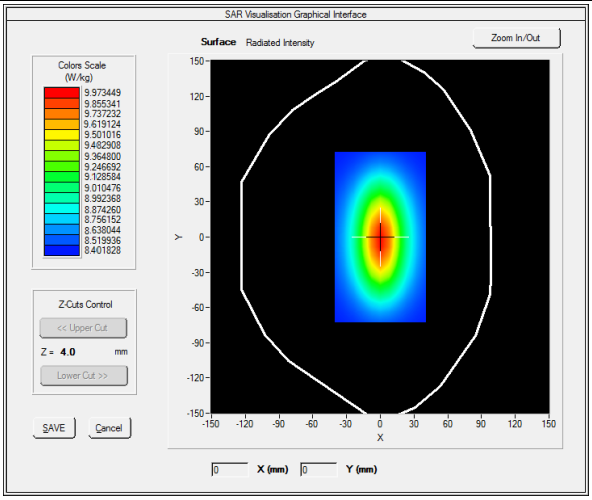
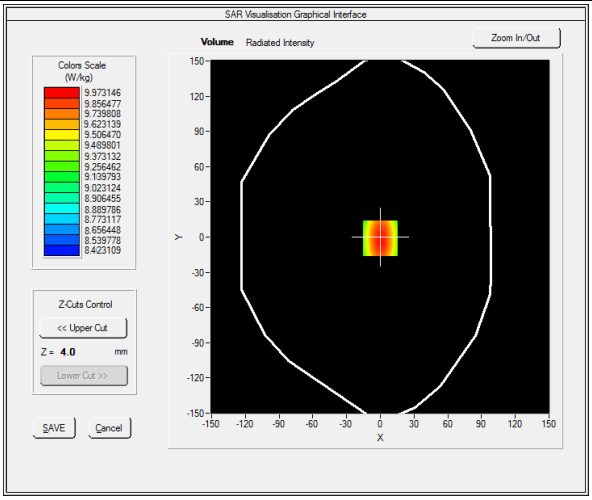
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 5.84; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW1800
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

Frequency (MHz)	1800.000000
Relative Permittivity (real part)	39.024890
Conductivity (S/m)	1.371250
Power Variation (%)	1.401232
Ambient Temperature	21.1
Liquid Temperature	21.2

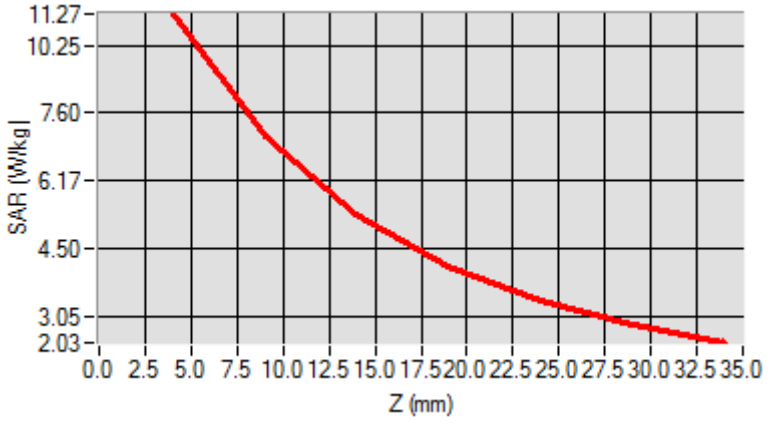
SURFACE SAR	VOLUME SAR
	

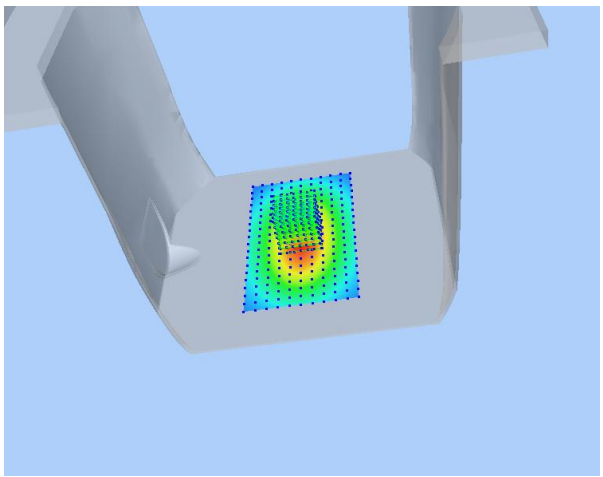
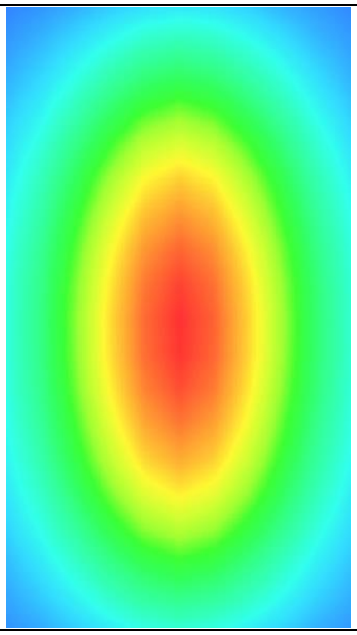
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	5.171252
SAR 1g (W/Kg)	9.611250

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	10.3455	7.1125	5.1026	3.425	3.0242	2.1125



3D screen shot	Hot spot position
	

MEASUREMENT 3

For Head Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 04/16/2019

Measurement duration: 12 minutes 21 seconds

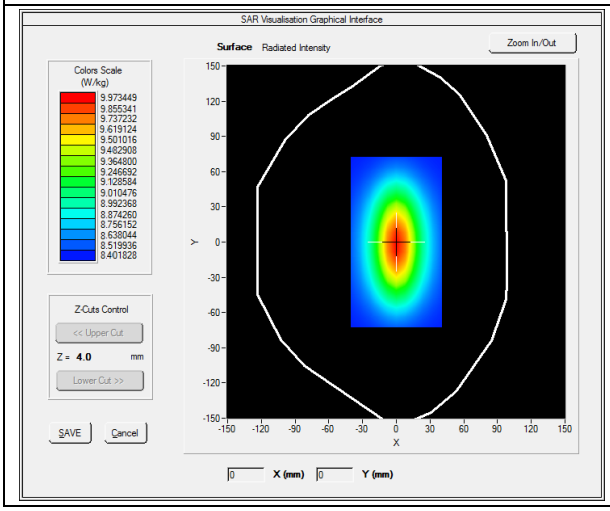
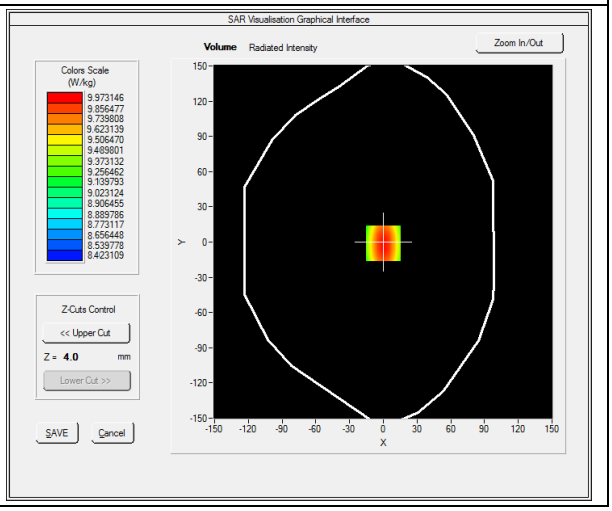
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.35; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW1900
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	1900.000000
Relative Permittivity (real part)	38.560124
Conductivity (S/m)	1.380369
Power Variation (%)	1.022540
Ambient Temperature	21.1
Liquid Temperature	21.3

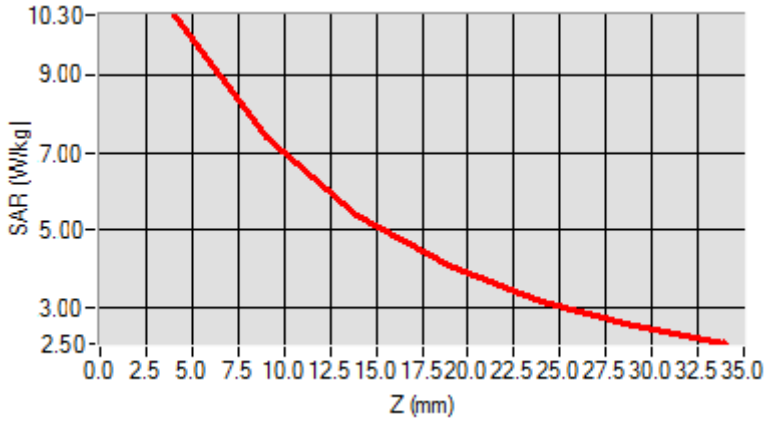
SURFACE SAR	VOLUME SAR
	

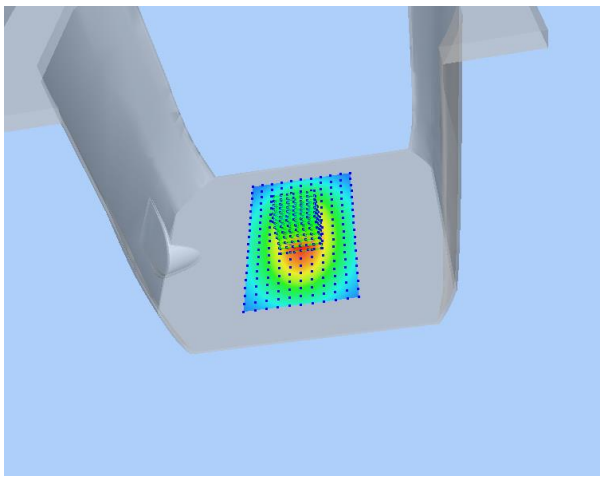
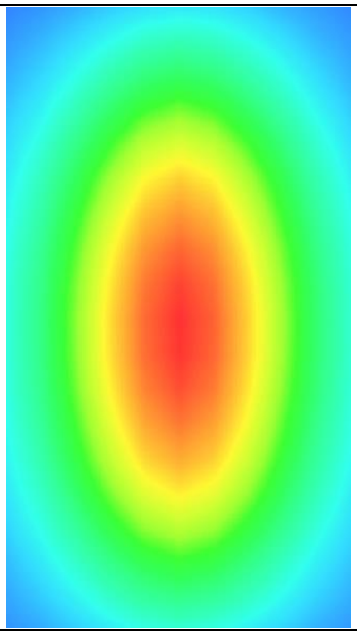
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	5.174526
SAR 1g (W/Kg)	9.913214

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	10.2354	6.8400	5.0121	4.1189	3.0522	2.8424



3D screen shot	Hot spot position
	

MEASUREMENT 4

For Head Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 04/17/2019

Measurement duration: 12 minutes 21 seconds

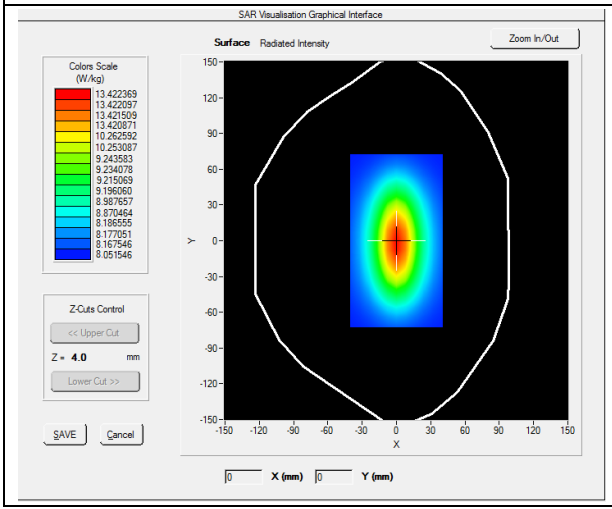
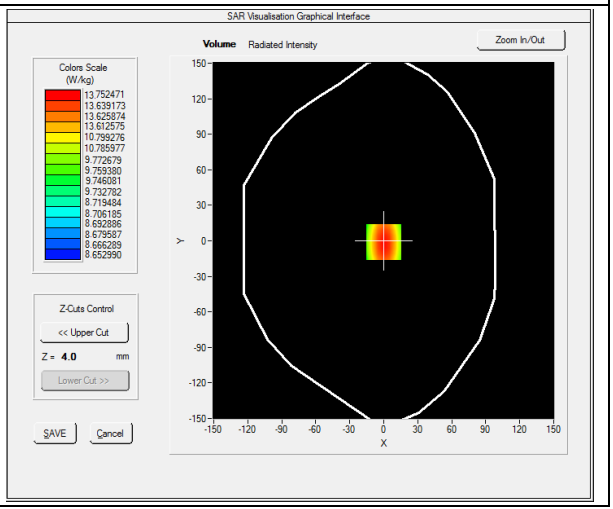
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 5.64; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2450
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	2450.000000
Relative Permittivity (real part)	38.153660
Conductivity (S/m)	1.740236
Power Variation (%)	1.141452
Ambient Temperature	21.1
Liquid Temperature	21.2

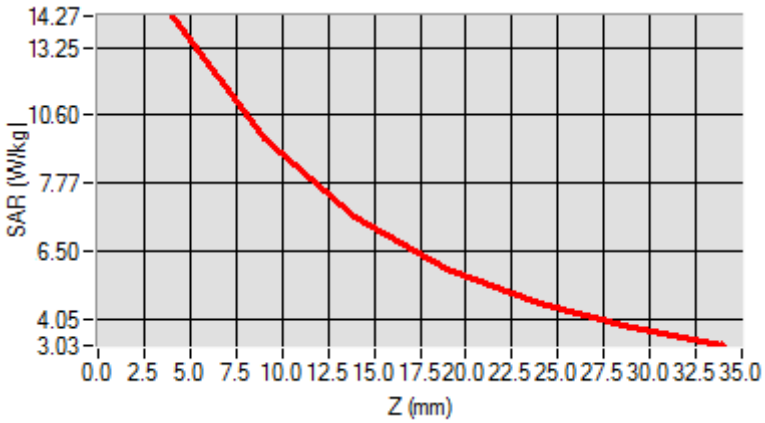
SURFACE SAR	VOLUME SAR
	

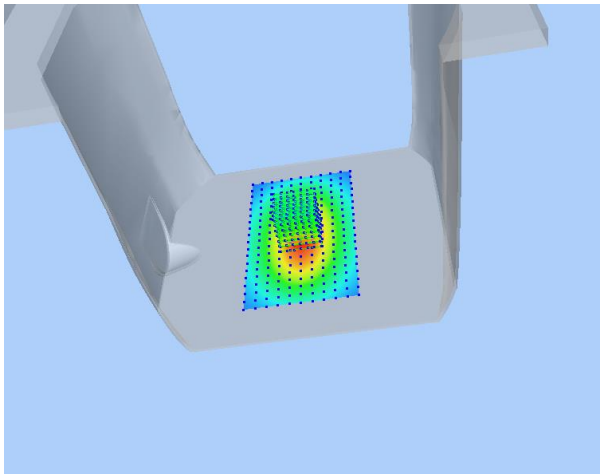
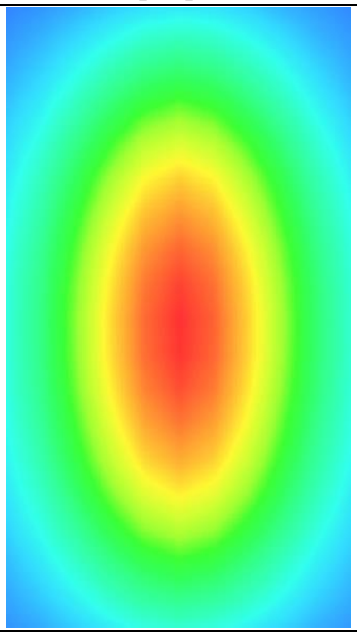
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	8.020427
SAR 1g (W/Kg)	13.452457

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	14.1034	12.0012	10.2624	7.4715	5.9022	4.5114



3D screen shot	Hot spot position
	

MEASUREMENT 5

For Head Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 04/17/2019

Measurement duration: 12 minutes 21 seconds

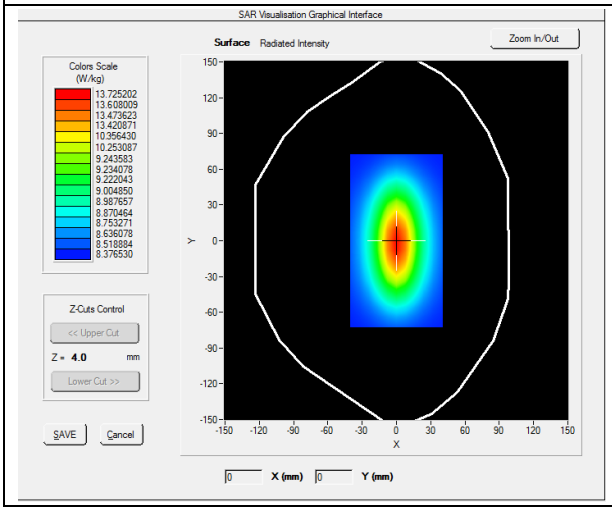
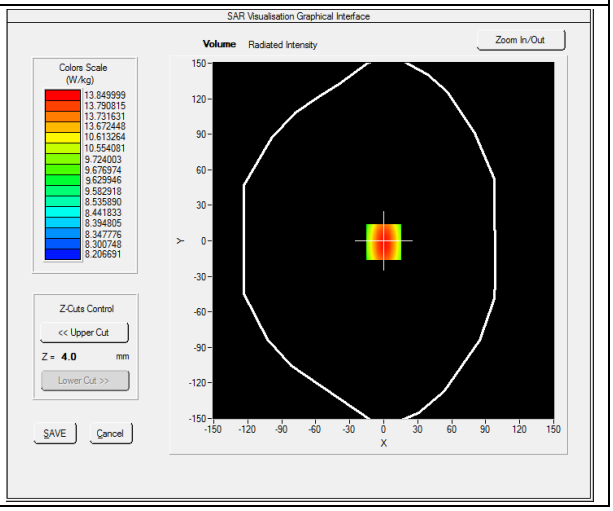
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 5.37; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2600
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	2600.000000
Relative Permittivity (real part)	38.631092
Conductivity (S/m)	1.930182
Power Variation (%)	1.028221
Ambient Temperature	21.1
Liquid Temperature	21.2

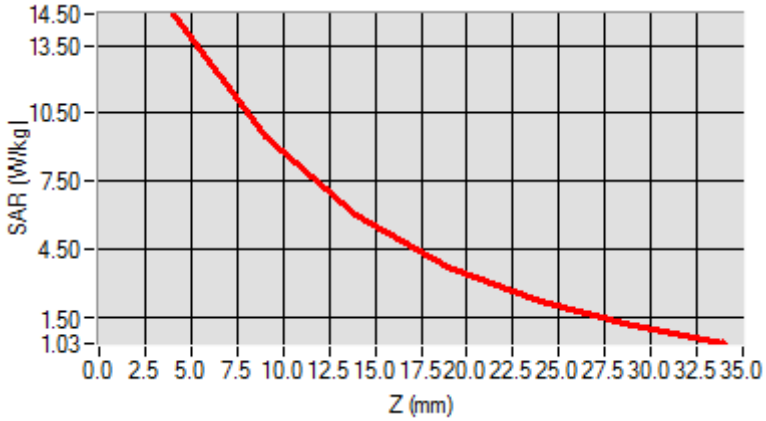
SURFACE SAR	VOLUME SAR
	

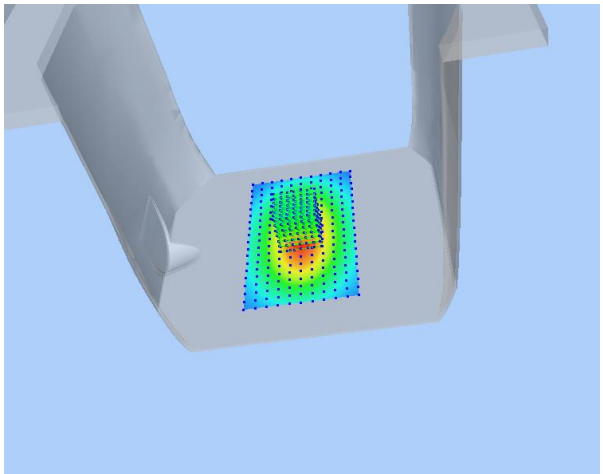
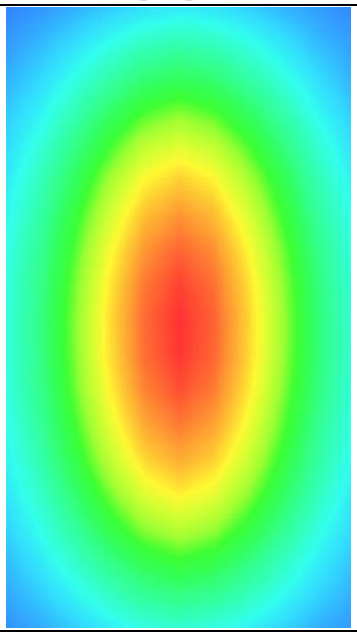
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	8.270822
SAR 1g (W/Kg)	13.670282

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	14.0426	12.1354	10.2965	7.4854	5.9354	4.5186



3D screen shot	Hot spot position
	

MEASUREMENT 6

For Head Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 04/17/2019

Measurement duration: 12 minutes 21 seconds

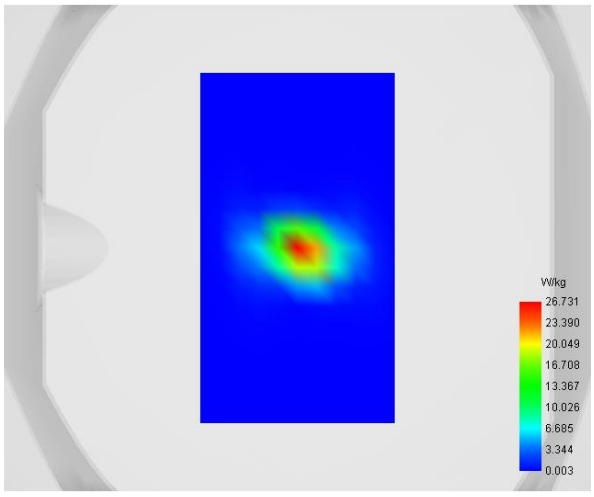
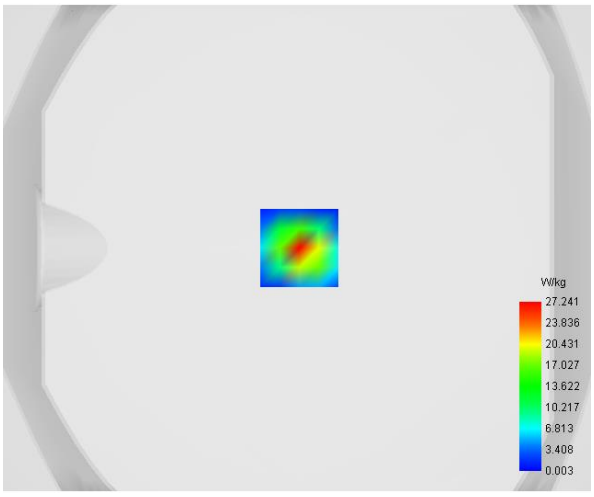
E-field Probe: SSE2 - SN 08/16 EPGO298; ConvF: 2.28; Calibrated: 2018/09/10

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW5200
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

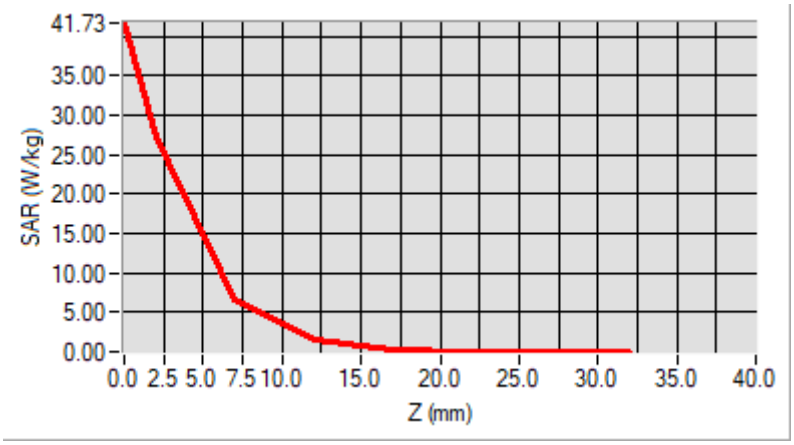
Frequency (MHz)	5200.000000
Relative Permittivity (real part)	35.612911
Conductivity (S/m)	4.871483
Power Variation (%)	0.943213
Ambient Temperature	21.1
Liquid Temperature	21.2

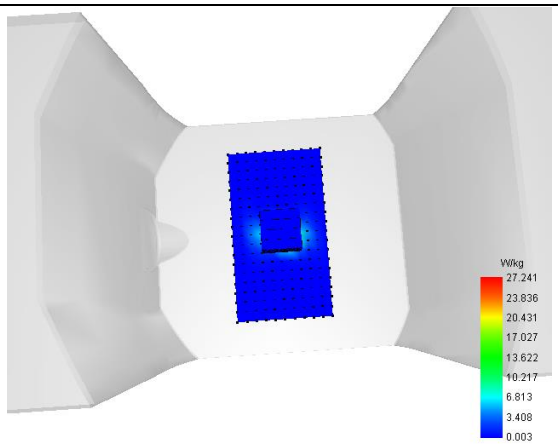
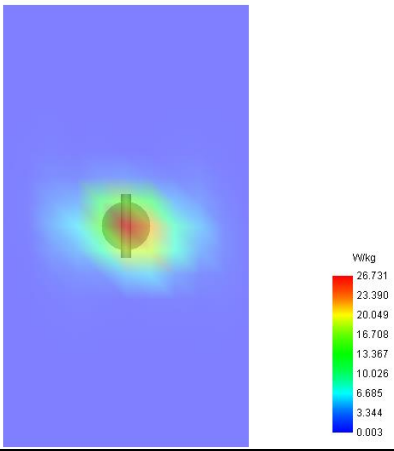
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=0.00

SAR 10g (W/Kg)	5.310334
SAR 1g (W/Kg)	16.946226

Z (mm)	0.00	2.00	7.00	12.00	17.00	22.00	27.00
SAR (W/Kg)	41.7264	27.2408	6.5746	1.6234	0.3765	0.0793	0.0129



3D screen shot	Hot spot position
	

MEASUREMENT 7

For Head Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 04/17/2019

Measurement duration: 12 minutes 21 seconds

E-field Probe: SSE2 - SN 08/16 EPGO298; ConvF: 2.44; Calibrated: 2018/09/10

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW5800
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

Frequency (MHz)	5800.000000
Relative Permittivity (real part)	35.612911
Conductivity (S/m)	5.171483
Power Variation (%)	0.943782
Ambient Temperature	21.1
Liquid Temperature	21.2

SURFACE SAR	VOLUME SAR