FCC SAR Test Report

Report No.	**:**	**SA181105W001**
Applicant	**:**	**TP-LINK Technologies Co., Ltd.**
Address	**:**	**Building 24-1F/3F/4F/5F, 28-1F/2F/3F/4F Science and Technology Park, Shennan Road, Nanshan District, Shenzhen City, Guangdong Province, P.R. China**
Product	**:**	**C5 Plus smartphone**
ID	**:**	**TE7C5PLUSV1**
Brand	**:**	**neffos**
Model No.	**:**	**TP7031C**
Additional Models	**:**	**TP7031CXYZZ**
Standards	**:**	**FCC 47 CFR Part 2 (2.1093) / IEEE C95.1:1992 / IEEE 1528:2013 KDB 865664 D01 v01r04 / KDB 865664 D02 v01r02 KDB 248227 D01 v02r02 / KDB 447498 D01 v06 / KDB 648474 D04 v01r03 / KDB 941225 D01 v03r01 / KDB 941225 D06 v02r01**
Sample Received Date	**:**	**Nov. 05, 2018**
Date of Testing	**:**	**Nov. 06, 2018 ~ Nov. 12, 2018**

CERTIFICATION: The above equipment have been tested by **BV 7LAYERS COMMUNICATIONS TECHNOLOGY (SHENZHEN) CO. LTD.**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's SAR characteristics under the conditions specified in this report. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by A2LA or any government agencies.

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ACCREDITED
Certificate # 3939.01

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Release Control Record

Report No.	Reason for Change	Date Issued
SA181105W001	Initial release	Nov. 26, 2018

1. Summary of Maximum SAR Value

Equipment Class	Mode	Highest Reported Head SAR_{1g} (W/kg)	Highest Reported Body-worn SAR_{1g} (1.0 cm Gap) (W/kg)	Highest Reported Hotspot SAR_{1g} (1.0 cm Gap) (W/kg)
PCE	GSM850	0.54	0.78	0.78
	GSM1900	0.36	0.80	0.97
	WCDMA II	0.70	0.84	1.15
	WCDMA V	0.61	0.88	0.88
DTS	2.4G WLAN	0.69	0.15	0.15
DSS	Bluetooth	N/A	N/A	N/A
Highest Simultaneous Transmission SAR		Head (W/kg)	Body-worn (W/kg)	Hotspot (W/kg)
PCE + DTS		1.30	1.03	1.15
PCE + DSS		N/A	0.97	N/A

Note:

1. The SAR limit **(Head & Body: SAR_{1g} 1.6 W/kg)** for general population / uncontrolled exposure is specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992

2. Description of Equipment Under Test

EUT Type	C5 Plus smartphone
ID	TE7C5PLUSV1
Brand Name	neffos
Model Name	TP7031C
Additional Models	TP7031CXYZZ
IMEI Code	867393040202013 / 867393040202021
HW Version	V01
SW Version	V01_20181023
Tx Frequency Bands (Unit: MHz)	GSM850 : 824.2 ~ 848.8 GSM1900 : 1850.2 ~ 1909.8 WCDMA Band II : 1852.4 ~ 1907.6 WCDMA Band V : 826.4 ~ 846.6 WLAN : 2412 ~ 2462 Bluetooth : 2402 ~ 2480
Uplink Modulations	GSM & GPRS : GMSK WCDMA : QPSK 802.11b : DSSS 802.11g/n: OFDM Bluetooth : GFSK, π/4-DQPSK, 8-DPSK, LE
Maximum Tune-up Conducted Power (Unit: dBm)	GSM850 : 32.0 GSM1900 : 30.0 WCDMA Band II : 21.0 WCDMA Band V : 22.0 WLAN 2.4G : 17.5 Bluetooth : 6.5
Antenna Type	WLAN: Fixed Internal Antenna WWAN: Fixed Internal Antenna
EUT Stage	Identical Prototype

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.
2. The above models are identical except models name for different clients. Description of model name differentiation as below:

X=2, indicates Grey; X=4, indicates Gold; X=7, indicates Blue; X=8, indicates Red;

Y=0, indicates the memory is 512MB RAM + 8GB Flash; Y=1, indicates the memory is 1GB RAM + 8GB Flash;

Y=2, indicates the memory is 1GB RAM + 16GB Flash;

Z='A' to 'Z', ZZ indicates different regions or customers.

List of Accessory:

Battery	**Brand Name**	neffos
	Model Name	NBL-40A2150
	Power Rating	3.8Vdc, 2150mAh
	Type	Li-ion
Earphone	**Brand Name**	Dong guan Tenji Technology Industrial Co., Ltd.
	Model Name	TJ101891E
	Signal Line Type	1.2 meter non-shielded cable without ferrite core

3. SAR Measurement System

3.1 Definition of Specific Absorption Rate (SAR)

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

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:

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

SAR is expressed in units of Watts per kilogram (W/kg)

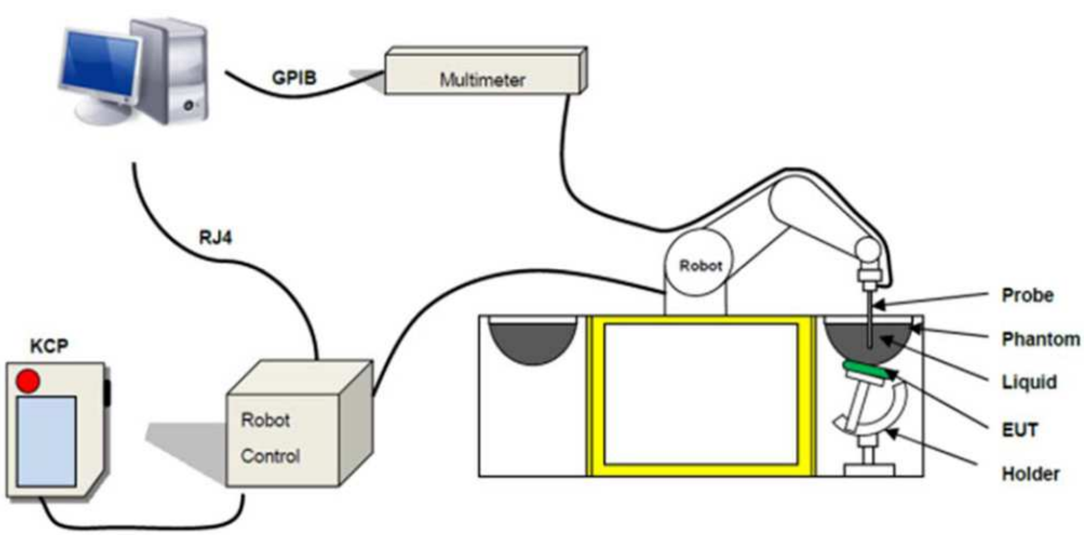
SAR measurement can be related to the electrical field in the tissue by

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

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

3.2 COMOSAR System

3.2.1 Measurement System Diagram



These measurements were performed with the automated near-field scanning system COMOSAR from SATIMO. The system is based on a high precision robot (working range: 850 mm), which positions the probes with a positional repeatability of better than ± 0.02 mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit.

The SAR measurements were conducted with dosimetric probe (manufactured by SATIMO), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in SAR standard with accuracy of better than ±10%.The spherical isotropy was evaluated with the procedure described in SAR standard and found to be better than ±0.25 dB. The phantom used was the SAM Phantom as described in FCC supplement C, IEEE P1528.

3.2.2 Robot

The COMOSAR system uses the high precision robots from KUKA. For the 6-axis controller system, the robot controller version (KUKA-KRC2sr) from KUKA is used. The KUKA robot series have many features that are important for our application:

- High precision (repeatability ±0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)

Fig-3.2 KUKA KR5

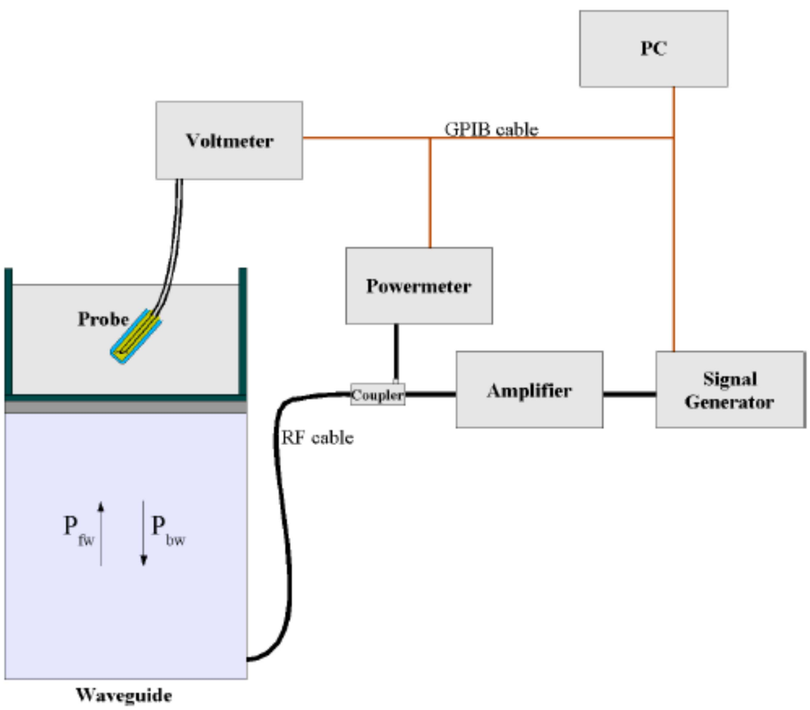
3.2.3 E-Field Probes

The SAR measurement is conducted with the dosimetric probe. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency.

Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Model	SSE2
Frequency	100 MHz to 6 GHz
Directivity	±0.25 dB in brain tissue (rotation around probe axis) ±0.5 dB in brain tissue (rotation normal probe axis)
Dynamic Range	0.001W/kg to > 100W/kg
Probe Linearity	± 0.25 dB
Dimensions	Overall length: 330 mm Tip diameter: 2.5 mm Distance from probe tip to dipole centers: <1.5 mm

E-Field Probe Calibration Process

Probe calibration is realized, in compliance with EN/IEC 62209-1/-2 and IEEE 1528 std, with CALISAR, SATIMO proprietary calibration system. The calibration is performed with the technique using reference waveguide.



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

Where :

Pfw = Forward Power

Pbw = Backward Power

a and b = Waveguide Dimensions

ı = Skin Depth

Keithley configuration

Rate=Medium; Filter=ON; RDGS=10; FILTER TYPE=MOVING AVERAGE; RANGE AUTO

After each calibration, a SAR measurement performed on a validation dipole and compared with a NPL calibrated probe, to verify it.

The Calibration factors, CF(N), for the 3 sensors corresponding to dipole 1, dipole 2 and dipole 3 are:

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

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

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

Where the DCP is the dipole compression point in mV

3.2.4 Phantoms

The phantom developed by SATIMO is produced in accordance with the specified in the standards. It has been designed to fit the COMOSAR phantom tables and is delivered with a plastic cover to prevent liquid evaporation.

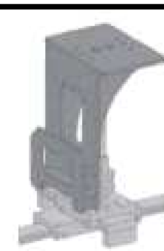
Model	SAM Phantom
Construction	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching reference points with the robot.
Material	The material is resistant to Glycol and offers high rigidity composite material based on fiberglass).
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)
Dimensions	Length: 1000 mm Width: 500 mm Height: 200 mm
Filling Volume	approx. 27 liters

Model	Elliptic Phantom	
Construction	Elliptic Phantom for compliance testing of handheld and body-mounted wireless devices. Elliptic Phantom is fully compatible with the IEC/EN 62209-2 standard and all known tissue simulating liquids. Elliptic Phantom has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching reference points.	
Material	The material is resistant to Glycol and offers high rigidity composite material based on fiberglass).	
Shell Thickness	2.0 ± 0.2 mm (bottom plate)	
Dimensions	Length: 600 mm Width: 400 mm Height: 200 mm	
Filling Volume	approx. 25 liters	

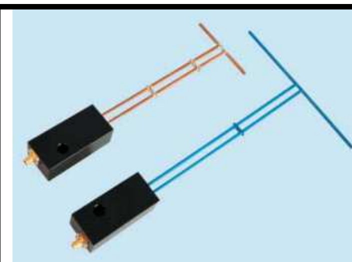
3.2.5 Device Holder

The positioning system is made of an extremely stable material, which ensures easy handling and reproducible positioning. It also allows correct positioning of the dipoles referenced by the IEEE, ANSI and IEC.

Model	Handset Positioning System	
Material properties	The positioning system is made of PETP. This material offers a low permittivity of 3.2 and low loss, with a loss tangent of 0.005 to minimize the influence of the DUT on measurement results.	
Mechanical properties	The positioning system developed by SATIMO allows a positioning resolution better than 1 mm. The system is fixed on a bottom rail “x axis” so that the positioning system can be quickly moved from the right to the left part of the phantom. In addition, it can be moved on a perpendicular “y axis” and the height can be adapted. The system is also composed of three rotation points for accurate positioning of the device’s acoustical output.	
Accuracy and precision	A curved rail on the top part allows the fast switch from the cheek to the tilt position. The required 15° angle for the tilt position can be easily checked thanks to a printed scale on the curved rail with a tolerance of ± 1°	

Model	Device Positioning System	
Material properties	The positioning system is made of PETP. This material offers a low permittivity of 3.2 and low loss, with a loss tangent of 0.005 to minimize the influence of the DUT on measurement results.	
Mechanical properties	2 rows of rail to cover easily the surface of the phantom. The fixing plate is perfectly adapted to larger devices, such as a PC which can be positioned in all configurations.	
Accuracy and precision	Graduated scale available on each axis. The DUT is fixed with a specific adaptable grip.	

3.2.6 System Validation Dipoles

Model	D-Serial	
Construction	Symmetrical dipole with λ0/4 ablaun. Enables measurement of feed point impedance with NWA. Matched for use near flat phantoms filled with tissue simulating solutions.	
Frequency	300 MHz to 6000 MHz	
Return Loss	> 20 dB	
Adaptation	S11 < -20 dB in specified validation Position	

3.2.7 Tissue Simulating Liquids

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. 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. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in Table-3.1.

	
Photo of Liquid Height for Head Position	**Photo of Liquid Height for Body Position**

The dielectric properties of the head tissue simulating liquids are defined in IEEE 1528, and KDB 865664 D01 Appendix A. For the body tissue simulating liquids, the dielectric properties are defined in KDB 865664 D01 Appendix A. The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using a dielectric assessment kit and a network analyzer.

Table-3.1 Targets of Tissue Simulating Liquid

Frequency (MHz)	Target Permittivity	Range of ±5%	Target Conductivity	Range of ±5%
For Head				
750	41.9	39.8 ~ 44.0	0.89	0.85 ~ 0.93
835	41.5	39.4 ~ 43.6	0.90	0.86 ~ 0.95
900	41.5	39.4 ~ 43.6	0.97	0.92 ~ 1.02
1450	40.5	38.5 ~ 42.5	1.20	1.14 ~ 1.26
1640	40.3	38.3 ~ 42.3	1.29	1.23 ~ 1.35
1750	40.1	38.1 ~ 42.1	1.37	1.30 ~ 1.44
1800	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
1900	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
2000	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
2300	39.5	37.5 ~ 41.5	1.67	1.59 ~ 1.75
2450	39.2	37.2 ~ 41.2	1.80	1.71 ~ 1.89
2600	39.0	37.1 ~ 41.0	1.96	1.86 ~ 2.06
3500	37.9	36.0 ~ 39.8	2.91	2.76 ~ 3.06
5200	36.0	34.2 ~ 37.8	4.66	4.43 ~ 4.89
5300	35.9	34.1 ~ 37.7	4.76	4.52 ~ 5.00
5500	35.6	33.8 ~ 37.4	4.96	4.71 ~ 5.21
5600	35.5	33.7 ~ 37.3	5.07	4.82 ~ 5.32
5800	35.3	33.5 ~ 37.1	5.27	5.01 ~ 5.53
For Body				
750	55.5	52.7 ~ 58.3	0.96	0.91 ~ 1.01
835	55.2	52.4 ~ 58.0	0.97	0.92 ~ 1.02
900	55.0	52.3 ~ 57.8	1.05	1.00 ~ 1.10
1450	54.0	51.3 ~ 56.7	1.30	1.24 ~ 1.37
1640	53.8	51.1 ~ 56.5	1.40	1.33 ~ 1.47
1750	53.4	50.7 ~ 56.1	1.49	1.42 ~ 1.56
1800	53.3	50.6 ~ 56.0	1.52	1.44 ~ 1.60
1900	53.3	50.6 ~ 56.0	1.52	1.44 ~ 1.60
2000	53.3	50.6 ~ 56.0	1.52	1.44 ~ 1.60
2300	52.9	50.3 ~ 55.5	1.81	1.72 ~ 1.90
2450	52.7	50.1 ~ 55.3	1.95	1.85 ~ 2.05
2600	52.5	49.9 ~ 55.1	2.16	2.05 ~ 2.27
3500	51.3	48.7 ~ 53.9	3.31	3.14 ~ 3.48
5200	49.0	46.6 ~ 51.5	5.30	5.04 ~ 5.57
5300	48.9	46.5 ~ 51.3	5.42	5.15 ~ 5.69
5500	48.6	46.2 ~ 51.0	5.65	5.37 ~ 5.93
5600	48.5	46.1 ~ 50.9	5.77	5.48 ~ 6.06
5800	48.2	45.8 ~ 50.6	6.00	5.70 ~ 6.30

The following table gives the recipes for tissue simulating liquids.

Table-3.2 Recipes of Tissue Simulating Liquid

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
H750	0.2	-	0.2	1.5	56.0	-	42.1	-
H835	0.2	-	0.2	1.5	57.0	-	41.1	-
H900	0.2	-	0.2	1.4	58.0	-	40.2	-
H1450	-	43.3	-	0.6	-	-	56.1	-
H1640	-	45.8	-	0.5	-	-	53.7	-
H1750	-	47.0	-	0.4	-	-	52.6	-
H1800	-	44.5	-	0.3	-	-	55.2	-
H1900	-	44.5	-	0.2	-	-	55.3	-
H2000	-	44.5	-	0.1	-	-	55.4	-
H2300	-	44.9	-	0.1	-	-	55.0	-
H2450	-	45.0	-	0.1	-	-	54.9	-
H2600	-	45.1	-	0.1	-	-	54.8	-
H3500	-	8.0	-	0.2	-	20.0	71.8	-
H5G	-	-	-	-	-	17.2	65.5	17.3
B750	0.2	-	0.2	0.8	48.8	-	50.0	-
B835	0.2	-	0.2	0.9	48.5	-	50.2	-
B900	0.2	-	0.2	0.9	48.2	-	50.5	-
B1450	-	34.0	-	0.3	-	-	65.7	-
B1640	-	32.5	-	0.3	-	-	67.2	-
B1750	-	31.0	-	0.2	-	-	68.8	-
B1800	-	29.5	-	0.4	-	-	70.1	-
B1900	-	29.5	-	0.3	-	-	70.2	-
B2000	-	30.0	-	0.2	-	-	69.8	-
B2300	-	31.0	-	0.1	-	-	68.9	-
B2450	-	31.4	-	0.1	-	-	68.5	-
B2600	-	31.8	-	0.1	-	-	68.1	-
B3500	-	28.8	-	0.1	-	-	71.1	-
B5G	-	-	-	-	-	10.7	78.6	10.7

3.3 SAR System Verification

The system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below.

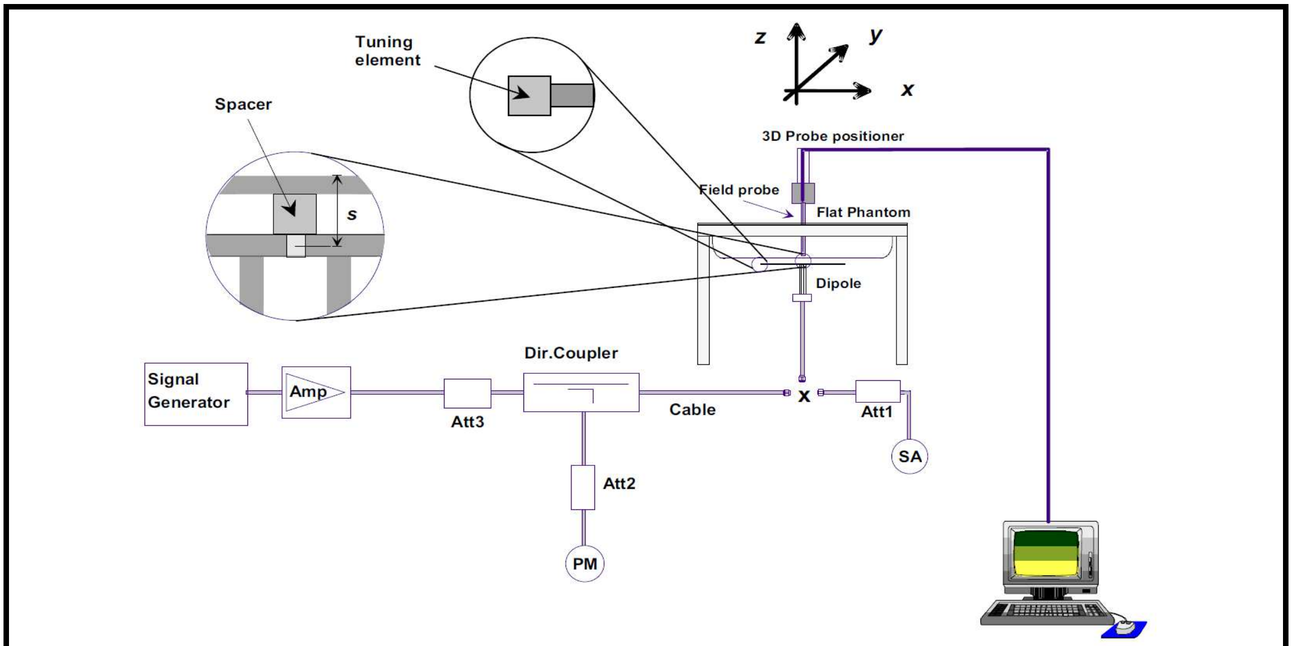


Fig-3.3 System Verification Setup

The validation dipole is placed beneath the flat phantom with the specific spacer in place. The distance spacer is touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The spectrum analyzer measures the forward power at the location of the system check dipole connector. The signal generator is adjusted for the desired forward power at the dipole connector and the power meter is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter.

After system check testing, the SAR result will be normalized to 1W forward input power and compared with the reference SAR value derived from validation dipole certificate report. The deviation of system check should be within 10 %.

3.4 SAR Measurement Procedure

According to the SAR 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

The SAR measurement procedures for each of test conditions are as follows:

(a) Make EUT to transmit maximum output power
(b) Measure conducted output power through RF cable
(c) Place the EUT in the specific position of phantom
(d) Perform SAR testing steps on the COMOSAR system
(e) Record the SAR value

3.4.1 Area & Zoom Scan Procedure

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 is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. According to KDB 865664 D01, the resolution for Area and Zoom scan is specified in the table below.

Items	<= 2 GHz	2-3 GHz	3-4 GHz	4-5 GHz	5-6 GHz
Area Scan (Δx, Δy)	<= 15 mm	<= 12 mm	<= 12 mm	<= 10 mm	<= 10 mm
Zoom Scan (Δx, Δy)	<= 8 mm	<= 5 mm	<= 5 mm	<= 4 mm	<= 4 mm
Zoom Scan (Δz)	<= 5 mm	<= 5 mm	<= 4 mm	<= 3 mm	<= 2 mm
Zoom Scan Volume	>= 30 mm	>= 30 mm	>= 28 mm	>= 25 mm	>= 22 mm

Note:

When zoom scan is required and report SAR is <= 1.4 W/kg, the zoom scan resolution of Δx / Δy (2-3GHz: <= 8 mm, 3-4GHz: <= 7 mm, 4-6GHz: <= 5 mm) may be applied.

3.4.2 Volume Scan Procedure

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

3.4.3 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In COMOSAR 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. If the power drift more than 5%, the SAR will be retested.

3.4.4 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 OPENSAR 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 (A/D values and measurement parameters)
(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 3-D 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

3.4.5 SAR Averaged Methods

In COMOSAR System, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

4. SAR Measurement Evaluation

4.1 EUT Configuration and Setting

<Connections between EUT and System Simulator>

For WWAN SAR testing, the EUT was linked and controlled by base station emulator (Agilent E5515C is used for GSM/WCDMA). Communication between the EUT and the emulator was established by air link. The distance between the EUT and the communicating antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of EUT. The EUT was set from the emulator to radiate maximum output power during SAR testing.

<Considerations Related to GSM / GPRS for Setup and Testing>

The maximum multi-slot capability supported by this device is as below.

1. This EUT is class B device
2. This EUT supports GPRS multi-slot class 12 (max. uplink: 4, max. downlink: 4, total timeslots: 5)

For GSM850 frequency band, the power control level is set to 5 for GSM mode and GPRS (GMSK: CS1). For GSM1900 frequency band, the power control level is set to 0 for GSM mode and GPRS (GMSK: CS1).

SAR test reduction for GPRS modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

<Considerations Related to WCDMA for Setup and Testing>

WCDMA Handsets Head SAR

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode.

WCDMA Handsets Body-worn SAR

SAR for body-worn configurations is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to other spreading codes and multiple $DPDCH_n$ configurations supported by the handset with 12.2 kbps RMC as the primary mode.

Handsets with Release 5 HSDPA

The 3G SAR test reduction procedure is applied to HSDPA body-worn configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSDPA using the HSDPA body SAR procedures in the “Release 5 HSDPA Data Devices”, for the highest reported SAR body-worn exposure configuration in 12.2 kbps RMC. Handsets with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

Handsets with Release 6 HSUPA

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

Release 5 HSDPA Data Devices

The 3G SAR test reduction procedure is applied to body SAR with 12.2 kbps RMC as the primary mode. Otherwise, body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, for the highest reported SAR configuration in 12.2 kbps RMC without HSDPA. HSDPA is configured according to the applicable UE category of a test device. The number of HS-DSCH / HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms and a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors (β_c, β_d), and HS-DPCCH power offset parameters (Δ_{ACK}, Δ_{NACK}, Δ_{CQI}) are set according to values indicated in below. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

Sub-test	β_c	β_d	β_d (SF)	β_c / β_d	β_{hs} (1)	CM (dB)(2)	MPR
1	2 / 15	15 / 15	64	2 / 15	4 / 15	0.0	0
2	12 / 15 (3)	15 / 15 (3)	64	12 / 15 (3)	24 / 15	1.0	0
3	15 / 15	8 / 15	64	15 / 8	30 / 15	1.5	0.5
4	15 / 15	4 / 15	64	15 / 4	30 / 15	1.5	0.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 8 ⇔ $A_{hs} = \beta_{hs} / \beta_c$ = 30 / 15 ⇔ β_{hs} = 30 / 15 * β_c.
Note 2: CM = 1 for β_c / β_d = 12 / 15, β_{hs} / β_c = 24 / 15.
Note 3: For subtest 2 the β_c / β_d ratio of 12 / 15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 11 / 15 and β_d = 15 / 15.

Release 6 HSUPA Data Devices

The 3G SAR test reduction procedure is applied to body SAR with 12.2 kbps RMC as the primary mode. Otherwise, body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 and power control algorithm 2, according to the highest reported body SAR configuration in 12.2 kbps RMC without HSPA. When VOIP applies to head exposure, the 3G SAR test reduction procedure is applied with 12.2 kbps RMC as the primary mode. Otherwise, the same HSPA configuration used for body SAR measurements are applied to head exposure testing. Due to inner loop power control requirements in HSPA, a communication test set is required for output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA are configured according to the β values indicated in below.

Sub-test	β_c	β_d	β_d (SF)	β_c / β_d	β_{hs} (1)	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM (2) (dB)	MPR (dB)	AG (4) Index	E-TFCI
1	11 / 15 (3)	15 / 15 (3)	64	11 / 15 (3)	22 / 15	209 / 225	1039 / 225	4	1	1.0	0.0	20	75
2	6 / 15	15 / 15	64	6 / 15	12 / 15	12 / 15	94 / 75	4	1	3.0	2.0	12	67
3	15 / 15	9 / 15	64	15 / 9	30 / 15	30 / 15	β_{ed1}: 47/15 β_{ed2}: 47/15	4	2	2.0	1.0	15	92
4	2 / 15	15 / 15	64	2 / 15	4 / 15	2 / 15	56 / 75	4	1	3.0	2.0	17	71
5	15 / 15 (4)	15 / 15 (4)	64	15 / 15 (4)	30 / 15	24 / 15	134 / 15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 8 ⇔ $A_{hs} = \beta_{hs} / \beta_c$ = 30 / 15 ⇔ β_{hs} = 30 / 15 * β_c.
Note 2: CM = 1 for β_c / β_d = 12 / 15, β_{hs} / β_c = 24 / 15. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c / β_d ratio of 11 / 15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 10 / 15 and β_d = 15 / 15.
Note 4: For subtest 5 the β_c / β_d ratio of 15 / 15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 14 / 15 and β_d = 15 / 15.
Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.
Note 6: β_{ed} cannot be set directly; it is set by Absolute Grant Value.

<Considerations Related to WLAN for Setup and Testing>

In general, various vendor specific external test software and chipset based internal test modes are typically used for SAR measurement. These chipset based test mode utilities are generally hardware and manufacturer dependent, and often include substantial flexibility to reconfigure or reprogram a device. A Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement. The test frequencies established using test mode must correspond to the actual channel frequencies. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. In addition, a periodic transmission duty factor is required for current generation SAR systems to measure SAR correctly. The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

According to KDB 248227 D01, this device has installed WLAN engineering testing software which can provide continuous transmitting RF signal. During WLAN SAR testing, this device was operated to transmit continuously at the maximum transmission duty with specified transmission mode, operating frequency, lowest data rate, and maximum output power.

Initial Test Configuration

An initial test configuration is determined for OFDM transmission modes in 2.4 GHz and 5 GHz bands according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band.

Subsequent Test Configuration

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units. Additional power measurements may be required to determine if SAR measurements are required for subsequent highest output power channels in a subsequent test configuration. When the highest reported SAR for the initial test configuration according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

SAR Test Configuration and Channel Selection

When multiple channel bandwidth configurations in a frequency band have the same specified maximum output power, the initial test configuration is using largest channel bandwidth, lowest order modulation, lowest data rate, and lowest order 802.11 mode (i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n). After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following.

1) The channel closest to mid-band frequency is selected for SAR measurement.

2) For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.

4.2 EUT Testing Position

According to KDB 648474 D04, handsets are tested for SAR compliance in head, body-worn accessory and other use configurations described in the following subsections.

4.2.1 Head Exposure Conditions

Head exposure is limited to next to the ear voice mode operations. Head SAR compliance is tested according to the test positions defined in IEEE Std 1528-2013 using the SAM phantom illustrated as below.

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.

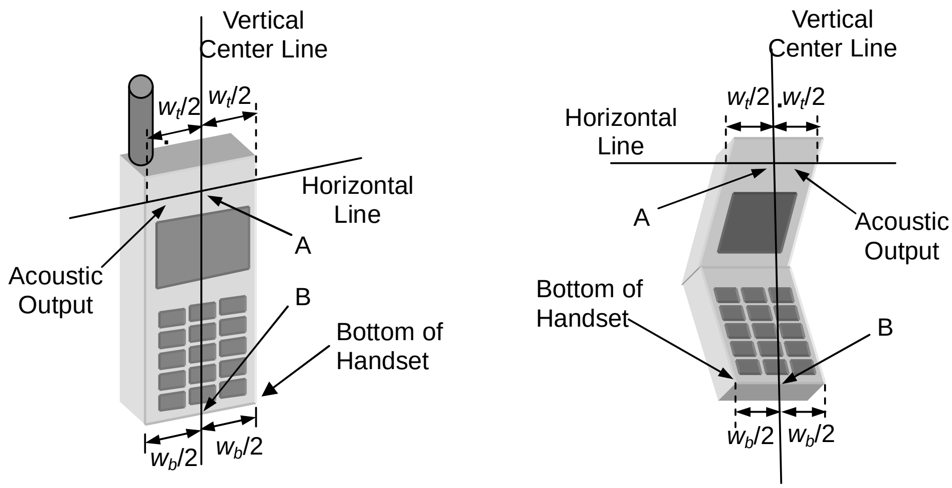


Fig-4.1 Illustration for Handset Vertical and Horizontal Reference Lines

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-4.2).

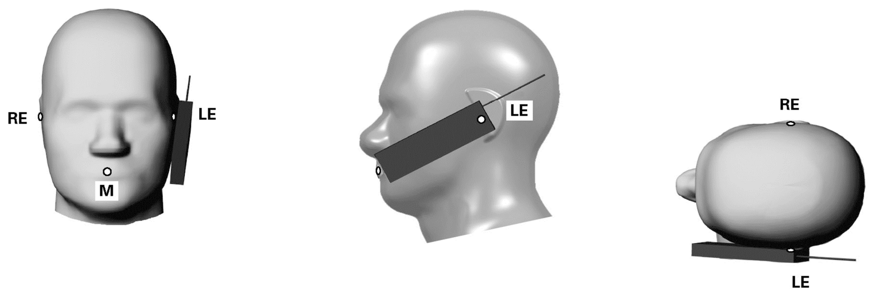


Fig-4.2 Illustration for Cheek Position

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-4.3).

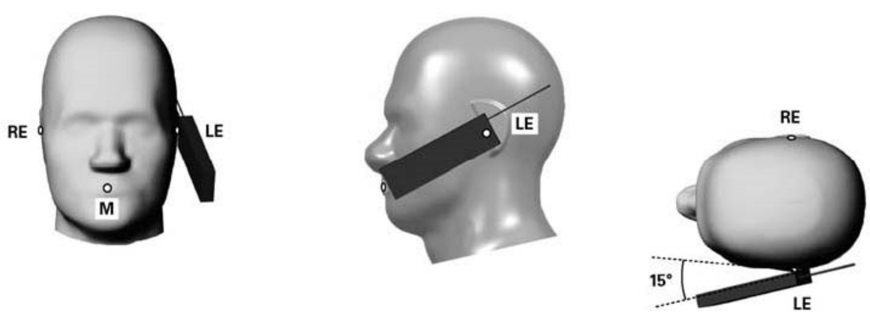


Fig-4.3 Illustration for Tilted Position

4.2.2 Body-worn Accessory Exposure Conditions

Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in KDB 447498 are used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Body-worn accessories that do not contain metallic or conductive components may be tested according to worst-case exposure configurations, typically according to the smallest test separation distance required for the group of body-worn accessories with similar operating and exposure characteristics. All body-worn accessories containing metallic components are tested in conjunction with the host device.

Body-worn accessory SAR compliance is based on a single minimum test separation distance for all wireless and operating modes applicable to each body-worn accessory used by the host, and according to the relevant voice and/or data mode transmissions and operations. If a body-worn accessory supports voice only operations in its normal and expected use conditions, testing of data mode for body-worn compliance is not required.

A conservative minimum test separation distance for supporting off-the-shelf body-worn accessories that may be acquired by users of consumer handsets is used to test for body-worn accessory SAR compliance. This distance is determined by the handset manufacturer, according to the requirements of Supplement C 01-01. Devices that are designed to operate on the body of users using lanyards and straps, or without requiring additional body-worn accessories, will be tested using a conservative minimum test separation distance <= 5 mm to support compliance.

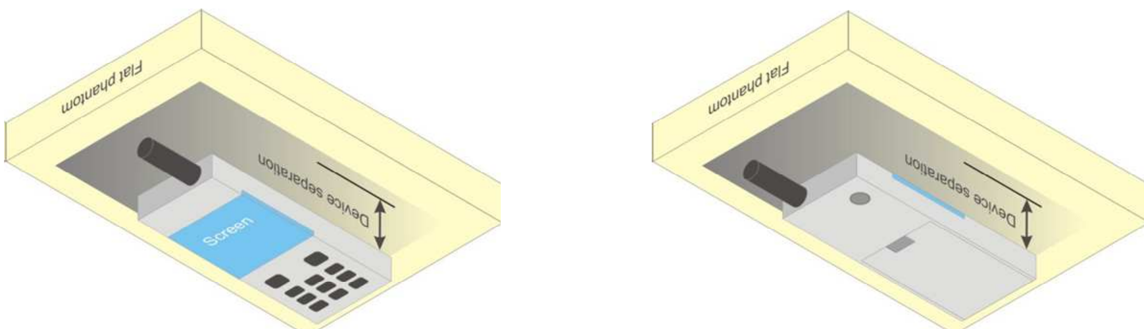
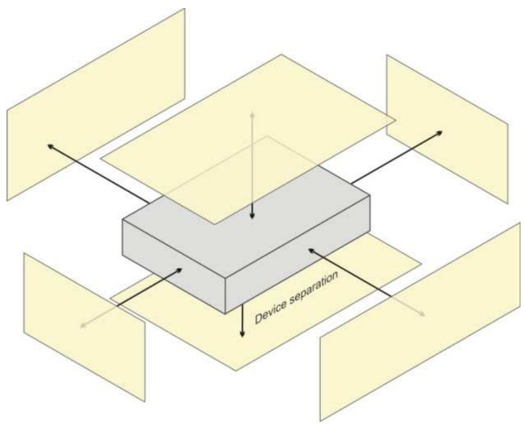


Fig-4.4 Illustration for Body Worn Position

4.2.3 Hotspot Mode Exposure Conditions

For handsets that support hotspot mode operations, with wireless router capabilities and various web browsing functions, the relevant hand and body exposure conditions are tested according to the hotspot SAR procedures in KDB 941225 D06. A test separation distance of 10 mm is required between the phantom and all surfaces and edges with a transmitting antenna located within 25 mm from that surface or edge. When the form factor of a handset is smaller than 9 cm x 5 cm, a test separation distance of 5 mm (instead of 10 mm) is required for testing hotspot mode. When the separation distance required for body-worn accessory testing is larger than or equal to that tested for hotspot mode, in the same wireless mode and for the same surface of the phone, the hotspot mode SAR data may be used to support body-worn accessory SAR compliance for that particular configuration (surface).



Based on the antenna location shown on appendix D of this report, the SAR testing required for hotspot mode is listed as below.

Antenna	Front Face	Rear Face	Left Side	Right Side	Top Side	Bottom Side
WWAN	V	V	V	V		V
WLAN / BT	V	V	V		V	

4.2.4 SAR Test Exclusion Evaluations

According to KDB 447498 D01, the SAR test exclusion condition is based on source-based time-averaged maximum conducted output power, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions. The SAR exclusion threshold is determined by the following.

Mode	Max. Tune-up Power (dBm)	Max. Tune-up Power (mW)	Body-Worn		
			Ant. to Surface (mm)	Calculated Result	Require SAR Testing?
BT (2.48 GHz)	6.5	4.47	10	0.7	No

4.2.5 Simultaneous Transmission Possibilities

The simultaneous transmission possibilities for this device are listed as below.

Simultaneous TX Combination	Capable Transmit Configurations	Head (Voice / VoIP)	Body-worn (Voice / VoIP)	Hotspot (Data)
1	GSM850 (Voice / Data) + WLAN (Data)	Yes	Yes	Yes
2	GSM1900 (Voice / Data) + WLAN (Data)	Yes	Yes	Yes
3	WCDMA II (Voice / Data) + WLAN (Data)	Yes	Yes	Yes
4	WCDMA V (Voice / Data) + WLAN (Data)	Yes	Yes	Yes
5	GSM850 (Voice / Data) + BT (Data)	No	Yes	No
6	GSM1900 (Voice / Data) + BT (Data)	No	Yes	No
7	WCDMA II (Voice / Data) + BT (Data)	No	Yes	No
8	WCDMA V (Voice / Data) + BT (Data)	No	Yes	No

Note : The WLAN and Bluetooth cannot transmit simultaneously, so there is no co-location test requirement for WLAN and Bluetooth.

4.3 Tissue Verification

The measuring results for tissue simulating liquid are shown as below.

Test Date	Tissue Type	Frequency (MHz)	Liquid Temp. (℃)	Measured Conductivity (σ)	Measured Permittivity (ε_r)	Target Conductivity (σ)	Target Permittivity (ε_r)	Conductivity Deviation (%)	Permittivity Deviation (%)
Nov. 06, 2018	HL850	835	21.2	0.92	42.32	0.90	41.50	2.22	1.98
Nov. 08, 2018	HL1900	1900	21.4	1.43	40.88	1.40	40.00	2.14	2.20
Nov. 12, 2018	HL2450	2450	21.5	1.77	39.87	1.80	39.20	-1.67	1.71
Nov. 06, 2018	BL850	835	21.2	0.99	56.43	0.97	55.20	2.06	2.23
Nov. 08, 2018	BL1900	1900	21.4	1.51	55.15	1.52	53.30	-0.66	3.47
Nov. 12, 2018	BL2450	2450	21.5	1.96	54.24	1.95	52.70	0.51	2.92

Note:

1. The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within ±5% of the target values. Liquid temperature during the SAR testing must be within ±2 ℃.
2. Since the maximum deviation of dielectric properties of the tissue simulating liquid is within 5%, SAR correction is evaluated in the measurement uncertainty shown on section 6 of this report.

4.4 System Validation

The SAR measurement system was validated according to procedures in KDB 865664 D01. The validation status in tabulated summary is as below.

Test Date	Probe S/N	Calibration Point		Measured Conductivity (σ)	Measured Permittivity (ε_r)	Validation for CW			Validation for Modulation		
						Sensitivity Range	Probe Linearity	Probe Isotropy	Modulation Type	Duty Factor	PAR
Nov. 06, 2018	SN 27/15 EPGO262	Head	835	0.92	42.32	Pass	Pass	Pass	N/A	N/A	N/A
Nov. 08, 2018	SN 27/15 EPGO262	Head	1900	1.43	40.88	Pass	Pass	Pass	GMSK	Pass	N/A
Nov. 12, 2018	SN 27/15 EPGO262	Head	2450	1.77	39.87	Pass	Pass	Pass	OFDM	N/A	Pass
Nov. 06, 2018	SN 27/15 EPGO262	Body	835	0.99	56.43	Pass	Pass	Pass	N/A	N/A	N/A
Nov. 08, 2018	SN 27/15 EPGO262	Body	1900	1.51	55.15	Pass	Pass	Pass	N/A	N/A	N/A
Nov. 12, 2018	SN 27/15 EPGO262	Body	2450	1.96	54.24	Pass	Pass	Pass	GMSK	Pass	N/A

4.5 System Verification

The measuring result for system verification is tabulated as below.

Test Date	Mode	Frequency (MHz)	1W Target SAR-1g (W/kg)	Measured SAR-1g (W/kg)	Normalized to 1W SAR-1g (W/kg)	Deviation (%)	Dipole S/N	Probe S/N
Nov. 06, 2018	Head	835	9.64	0.96	9.62	-0.21	SN 18/11 DIPC150	SN 27/15 EPGO262
Nov. 08, 2018	Head	1900	39.88	3.88	38.75	-2.83	SN 18/11 DIPG153	SN 27/15 EPGO262
Nov. 12, 2018	Head	2450	53.18	5.25	52.48	-1.32	SN 18/11 DIPJ155	SN 27/15 EPGO262
Nov. 06, 2018	Body	835	9.96	0.96	9.57	-3.92	SN 18/11 DIPC150	SN 27/15 EPGO262
Nov. 08, 2018	Body	1900	40.38	4.15	41.48	2.72	SN 18/11 DIPG153	SN 27/15 EPGO262
Nov. 12, 2018	Body	2450	52.73	5.11	51.13	-3.03	SN 18/11 DIPJ155	SN 27/15 EPGO262

Note:

Comparing to the reference SAR value provided by MVG, the validation data should be within its specification of 10 %. The result indicates the system check can meet the variation criterion and the plots can be referred to Appendix A of this report.

4.6 Maximum Output Power

4.6.1 Maximum Conducted Power

The maximum conducted average power (Unit: dBm) including tune-up tolerance is shown as below.

Mode	GSM850	GSM1900
GSM (GMSK, 1Tx-slot)	32.0	30.0
GPRS (GMSK, 1Tx-slot)	32.0	30.0
GPRS (GMSK, 2Tx-slot)	32.0	29.0
GPRS (GMSK, 3Tx-slot)	30.0	26.0
GPRS (GMSK, 4Tx-slot)	28.0	25.0

Mode	WCDMA Band II	WCDMA Band V
RMC 12.2K	21.0	22.0
HSDPA	21.0	21.0
HSUPA	20.5	21.5

Mode	2.4G WLAN
802.11b	17.5
802.11g	14.5
802.11n HT20	14.5
802.11n HT40	13.5

Mode	2.4G Bluetooth
GFSK	6.5
π/4-DQPSK	6.5
8-DPSK	6.5
LE	6.5

4.6.2 Measured Conducted Power Result

The measuring conducted average power (Unit: dBm) is shown as below.

Band	GSM850			GSM1900		
Channel	128	189	251	512	661	810
Frequency (MHz)	824.2	836.4	848.8	1850.2	1880.0	1909.8
Maximum Burst-Averaged Output Power						
GSM (GMSK, 1Tx-slot)	31.68	31.65	31.63	28.85	28.65	28.51
GPRS (GMSK, 1Tx-slot)	**31.81**	31.78	31.76	**28.98**	28.78	28.64
GPRS (GMSK, 2Tx-slot)	30.99	30.96	30.94	28.13	27.93	27.79
GPRS (GMSK, 3Tx-slot)	28.81	28.78	28.76	25.76	25.56	25.42
GPRS (GMSK, 4Tx-slot)	27.52	27.49	27.47	24.51	24.31	24.17
Maximum Frame-Averaged Output Power						
GSM (GMSK, 1Tx-slot)	22.68	22.65	22.63	19.85	19.65	19.51
GPRS (GMSK, 1Tx-slot)	22.81	22.78	22.76	19.98	19.78	19.64
GPRS (GMSK, 2Tx-slot)	**24.99**	24.96	24.94	**22.13**	21.93	21.79
GPRS (GMSK, 3Tx-slot)	24.55	24.52	24.50	21.50	21.30	21.16
GPRS (GMSK, 4Tx-slot)	24.52	24.49	24.47	21.51	21.31	21.17

Note:

1. SAR testing was performed on the maximum frame-averaged power mode.
2. The frame-averaged power is linearly proportion to the slot number configured and it is linearly scaled the maximum burst-averaged power based on time slots. The calculated method is shown as below:
   Frame-averaged power = 10 x log (Burst-averaged power mW x Slot used / 8)

Band	WCDMA Band II			WCDMA Band V			3GPP MPR (dB)
Channel	9262	9400	9538	4132	4182	4233	
Frequency (MHz)	1852.4	1880.0	1907.6	826.4	836.4	846.6	
RMC 12.2K	**20.22**	20.05	19.79	**21.14**	20.85	20.84	-
HSDPA Subtest-1	20.05	19.88	19.62	20.69	20.40	20.39	0
HSDPA Subtest-2	20.13	19.96	19.70	20.55	20.26	20.25	0
HSDPA Subtest-3	20.07	19.90	19.64	20.29	20.00	19.99	0.5
HSDPA Subtest-4	20.02	19.85	19.59	20.26	19.97	19.96	0.5
HSUPA Subtest-1	20.04	19.87	19.61	20.97	20.68	20.67	0
HSUPA Subtest-2	19.45	19.28	19.02	19.37	19.08	19.07	2
HSUPA Subtest-3	19.65	19.48	19.22	20.28	19.99	19.98	1
HSUPA Subtest-4	19.44	19.27	19.01	19.36	19.07	19.06	2
HSUPA Subtest-5	20.01	19.84	19.58	20.94	20.65	20.64	0

<WLAN 2.4G>

Mode	802.11b		
Channel / Frequency (MHz)	1 (2412)	6 (2437)	11 (2462)
Average Power	17.01	16.86	**17.25**
Mode	802.11g		
Channel / Frequency (MHz)	1 (2412)	6 (2437)	11 (2462)
Average Power	12.86	**14.41**	13.43
Mode	802.11n (HT20)		
Channel / Frequency (MHz)	1 (2412)	6 (2437)	11 (2462)
Average Power	12.77	**14.47**	13.40
Mode	802.11n (HT40)		
Channel / Frequency (MHz)	3 (2422)	6 (2437)	9 (2452)
Average Power	10.02	**13.43**	10.72

<Bluetooth>

Mode	Bluetooth GFSK		
Channel / Frequency (MHz)	0 (2402)	39 (2441)	78 (2480)
Average Power	5.98	6.28	**6.37**
Mode	Bluetooth π/4-DQPSK		
Channel / Frequency (MHz)	0 (2402)	39 (2441)	78 (2480)
Average Power	6.07	**6.08**	5.81
Mode	Bluetooth 8-DPSK		
Channel / Frequency (MHz)	0 (2402)	39 (2441)	78 (2480)
Average Power	5.81	**6.10**	5.91
Mode	Bluetooth LE		
Channel / Frequency (MHz)	0 (2402)	19 (2440)	39 (2480)
Average Power	5.67	**6.06**	5.83

4.7 SAR Testing Results

4.7.1 SAR Test Reduction Considerations

<KDB 447498 D01, General RF Exposure Guidance>

Testing of other required channels within the operating mode of a frequency band is not required when the reported SAR for the mid-band or highest output power channel is:

(1) ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz

(2) ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz

(3) ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

<KDB 941225 D01, 3G SAR Measurement Procedures>

The mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ 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.

<KDB 248227 D01, SAR Guidance for Wi-Fi Transmitters>

(1) For handsets operating next to ear, hotspot mode or mini-tablet configurations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When the reported SAR of initial test position is <= 0.4 W/kg, SAR testing for remaining test positions is not required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is <= 0.8 W/kg or all test positions are measured.

(2) For WLAN 2.4 GHz, the highest measured maximum output power channel for DSSS was selected for SAR measurement. When the reported SAR is <= 0.8 W/kg, no further SAR testing is required. Otherwise, SAR is evaluated at the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel. 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 <= 1.2 W/kg.

4.7.2 SAR Results for Head Exposure Condition

Plot No.	Band	Mode	Test Position	Ch.	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Power Drift (%)	Measured SAR-1g (W/kg)	Scaling Factor	Scaled SAR-1g (W/kg)
1#	GSM850	GPRS10	Right Cheek	128	32.0	30.99	0.02	0.426	1.26	**0.54**
	GSM850	GPRS10	Right Tilted	128	32.0	30.99	0.55	0.247	1.26	0.31
	GSM850	GPRS10	Left Cheek	128	32.0	30.99	-2.21	0.381	1.26	0.48
	GSM850	GPRS10	Left Tilted	128	32.0	30.99	-2.43	0.239	1.26	0.30
	GSM1900	GPRS10	Right Cheek	512	29.0	28.13	1.29	0.12	1.22	0.15
	GSM1900	GPRS10	Right Tilted	512	29.0	28.13	1.51	0.07	1.22	0.09
2#	GSM1900	GPRS10	Left Cheek	512	29.0	28.13	-4.25	0.295	1.22	**0.36**
	GSM1900	GPRS10	Left Tilted	512	29.0	28.13	-0.64	0.084	1.22	0.10
	WCDMA II	RMC12.2K	Right Cheek	9262	21.0	20.22	0.04	0.283	1.20	0.34
	WCDMA II	RMC12.2K	Right Tilted	9262	21.0	20.22	0.27	0.152	1.20	0.18
3#	WCDMA II	RMC12.2K	Left Cheek	9262	21.0	20.22	-1.76	0.588	1.20	**0.70**
	WCDMA II	RMC12.2K	Left Tilted	9262	21.0	20.22	1.06	0.384	1.20	0.46
4#	WCDMA V	RMC12.2K	Right Cheek	4132	22.0	21.14	0.62	0.501	1.22	**0.61**
	WCDMA V	RMC12.2K	Right Tilted	4132	22.0	21.14	0.84	0.312	1.22	0.38
	WCDMA V	RMC12.2K	Left Cheek	4132	22.0	21.14	0	0.459	1.22	0.56
	WCDMA V	RMC12.2K	Left Tilted	4132	22.0	21.14	0.02	0.302	1.22	0.37

Plot No.	Band	Mode	Test Position	Ch.	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Power Drift (%)	Measured SAR-1g (W/kg)	Scaling Factor	Scaled SAR-1g (W/kg)
5#	802.11b	-	Right Cheek	11	17.5	17.25	-2	0.654	1.06	**0.69**
	802.11b	-	Right Tilted	11	17.5	17.25	-1.16	0.49	1.06	0.52
	802.11b	-	Left Cheek	11	17.5	17.25	-2.49	0.326	1.06	0.35
	802.11b	-	Left Tilted	11	17.5	17.25	1.24	0.277	1.06	0.29

4.7.3 SAR Results for Body-worn Exposure Condition (Separation Distance is 1.0 cm Gap)

Plot No.	Band	Mode	Test Position	Ch.	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Power Drift (%)	Measured SAR-1g (W/kg)	Scaling Factor	Scaled SAR-1g (W/kg)
	GSM850	GPRS10	Front Face	128	32.0	30.99	-2.67	0.407	1.26	0.51
6#	GSM850	GPRS10	Rear Face	128	32.0	30.99	1.27	0.619	1.26	**0.78**
7#	GSM1900	GPRS10	Front Face	512	29.0	28.13	-0.93	0.652	1.22	**0.80**
	GSM1900	GPRS10	Rear Face	512	29.0	28.13	-1.34	0.312	1.22	0.38
8#	WCDMA II	RMC12.2K	Front Face	9262	21.0	20.22	-1.67	0.703	1.20	**0.84**
	WCDMA II	RMC12.2K	Rear Face	9262	21.0	20.22	-2.54	0.363	1.20	0.43
	WCDMA II	RMC12.2K	Front Face	9400	21.0	20.05	0.22	0.652	1.24	0.81
	WCDMA II	RMC12.2K	Front Face	9538	21.0	19.79	-0.12	0.6	1.32	0.79
	WCDMA II	RMC12.2K	Front Face	9262	21.0	20.22	-2.34	0.674	1.20	0.81
	WCDMA V	RMC12.2K	Front Face	4132	22.0	21.14	0.03	0.494	1.22	0.60
9#	WCDMA V	RMC12.2K	Rear Face	4132	22.0	21.14	-0.73	0.723	1.22	**0.88**
	WCDMA V	RMC12.2K	Rear Face	4182	22.0	20.85	-0.14	0.652	1.30	0.85
	WCDMA V	RMC12.2K	Rear Face	4233	22.0	20.84	-1.27	0.631	1.31	0.82
	WCDMA V	RMC12.2K	Rear Face	4132	22.0	21.14	-1.21	0.705	1.22	0.86

Plot No.	Band	Mode	Test Position	Ch.	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Power Drift (%)	Measured SAR-1g (W/kg)	Scaling Factor	Scaled SAR-1g (W/kg)
	802.11b	-	Front Face	11	17.5	17.25	-0.52	0.131	1.06	0.14
10#	802.11b	-	Rear Face	11	17.5	17.25	-0.4	0.14	1.06	**0.15**

4.7.4 SAR Results for Hotspot Exposure Condition (Separation Distance is 1.0 cm Gap)

Plot No.	Band	Mode	Test Position	Ch.	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Power Drift (%)	Measured SAR-1g (W/kg)	Scaling Factor	Scaled SAR-1g (W/kg)
	GSM850	GPRS10	Front Face	128	32.0	30.99	-2.67	0.407	1.26	0.51
6#	GSM850	GPRS10	Rear Face	128	32.0	30.99	1.27	0.619	1.26	**0.78**
	GSM850	GPRS10	Left Side	128	32.0	30.99	-0.08	0.186	1.26	0.23
	GSM850	GPRS10	Right Side	128	32.0	30.99	-3.86	0.276	1.26	0.35
	GSM850	GPRS10	Bottom Side	128	32.0	30.99	-0.47	0.059	1.26	0.07
	GSM1900	GPRS10	Front Face	512	29.0	28.13	-0.93	0.652	1.22	0.80
	GSM1900	GPRS10	Rear Face	512	29.0	28.13	-1.34	0.312	1.22	0.38
	GSM1900	GPRS10	Left Side	512	29.0	28.13	-2.1	0.197	1.22	0.24
	GSM1900	GPRS10	Right Side	512	29.0	28.13	-2.55	0.075	1.22	0.09
11#	GSM1900	GPRS10	Bottom Side	512	29.0	28.13	-0.8	0.796	1.22	**0.97**
	GSM1900	GPRS10	Bottom Side	661	29.0	27.93	1.23	0.723	1.28	0.92
	GSM1900	GPRS10	Bottom Side	810	29.0	27.79	-0.03	0.701	1.32	0.93
	GSM1900	GPRS10	Bottom Side	512	29.0	28.13	-0.13	0.784	1.22	0.96
	WCDMA II	RMC12.2K	Front Face	9262	21.0	20.22	-1.67	0.703	1.20	0.84
	WCDMA II	RMC12.2K	Rear Face	9262	21.0	20.22	-2.54	0.363	1.20	0.43
	WCDMA II	RMC12.2K	Left Side	9262	21.0	20.22	-1.07	0.241	1.20	0.29
	WCDMA II	RMC12.2K	Right Side	9262	21.0	20.22	0.45	0.089	1.20	0.11
	WCDMA II	RMC12.2K	Bottom Side	9262	21.0	20.22	-4	0.755	1.20	0.90
	WCDMA II	RMC12.2K	Front Face	9400	21.0	20.05	0.22	0.652	1.24	0.81
	WCDMA II	RMC12.2K	Front Face	9538	21.0	19.79	-0.12	0.6	1.32	0.79
12#	WCDMA II	RMC12.2K	Bottom Side	9400	21.0	20.05	-0.76	0.928	1.24	**1.15**
	WCDMA II	RMC12.2K	Bottom Side	9538	21.0	19.79	-4	0.747	1.32	0.99
	WCDMA II	RMC12.2K	Bottom Side	9400	21.0	20.05	-0.14	0.911	1.24	1.13
	WCDMA V	RMC12.2K	Front Face	4132	22.0	21.14	0.03	0.494	1.22	0.60
9#	WCDMA V	RMC12.2K	Rear Face	4132	22.0	21.14	-0.73	0.723	1.22	**0.88**
	WCDMA V	RMC12.2K	Left Side	4132	22.0	21.14	-0.87	0.252	1.22	0.31
	WCDMA V	RMC12.2K	Right Side	4132	22.0	21.14	-0.44	0.391	1.22	0.48
	WCDMA V	RMC12.2K	Bottom Side	4132	22.0	21.14	0.94	0.074	1.22	0.09
	WCDMA V	RMC12.2K	Rear Face	4182	22.0	20.85	-0.14	0.652	1.30	0.85
	WCDMA V	RMC12.2K	Rear Face	4233	22.0	20.84	-1.27	0.631	1.31	0.82
	WCDMA V	RMC12.2K	Rear Face	4132	22.0	21.14	-1.21	0.705	1.22	0.86

Plot No.	Band	Mode	Test Position	Ch.	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Power Drift (%)	Measured SAR-1g (W/kg)	Scaling Factor	Scaled SAR-1g (W/kg)
	802.11b	-	Front Face	11	17.5	17.25	-0.52	0.131	1.06	0.14
10#	802.11b	-	Rear Face	11	17.5	17.25	-0.4	0.14	1.06	**0.15**
	802.11b	-	Left Side	11	17.5	17.25	-1.29	0.062	1.06	0.07
	802.11b	-	Right Side	11	17.5	17.25	1.7	0.024	1.06	0.03
	802.11b	-	Top Side	11	17.5	17.25	-4.3	0.127	1.06	0.13

4.7.5 SAR Measurement Variability

According to KDB 865664 D01, SAR measurement variability was assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. Alternatively, if the highest measured SAR for both head and body tissue-equivalent media are ≤ 1.45 W/kg and the ratio of these highest SAR values, i.e., largest divided by smallest value, is ≤ 1.10, the highest SAR configuration for either head or body tissue-equivalent medium may be used to perform the repeated measurement. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR repeated measurement procedure:

1. When the highest measured SAR is < 0.80 W/kg, repeated measurement is not required.
2. When the highest measured SAR is >= 0.80 W/kg, repeat that measurement once.
3. 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, perform a second repeated measurement.
4. If the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20, and the original, first or second repeated measurement is >= 1.5 W/kg, perform a third repeated measurement.

Band	Mode	Test Position	Ch.	Original Measured SAR-1g (W/kg)	1st Repeated SAR-1g (W/kg)	L/S Ratio	2nd Repeated SAR-1g (W/kg)	L/S Ratio	3rd Repeated SAR-1g (W/kg)	L/S Ratio
GSM1900	GPRS10	Bottom Side	512	0.796	0.784	1.02	N/A	N/A	N/A	N/A
WCDMA II	RMC12.2K	Front Face	9262	0.703	0.674	1.04	N/A	N/A	N/A	N/A
WCDMA II	RMC12.2K	Bottom Side	9400	0.928	0.911	1.02	N/A	N/A	N/A	N/A
WCDMA V	RMC12.2K	Rear Face	4132	0.723	0.705	1.03	N/A	N/A	N/A	N/A

4.7.6 Simultaneous Multi-band Transmission Evaluation

<Estimated SAR Calculation>

According to KDB 447498 D01, when standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR was estimated according to following formula to result in substantially conservative SAR values of <= 0.4 W/kg to determine simultaneous transmission SAR test exclusion.

$$\text{Estimated SAR} = \frac{\text{Max. Tune up Power}_{(\text{mW})}}{\text{Min. Test Separation Distance}_{(\text{mm})}} \times \frac{\sqrt{f_{(\text{GHz})}}}{7.5}$$

If the minimum test separation distance is < 5 mm, a distance of 5 mm is used for estimated SAR calculation. When the test separation distance is > 50 mm, the 0.4 W/kg is used for SAR-1g.

Mode / Band	Frequency (GHz)	Max. Tune-up Power (dBm)	Test Position	Separation Distance (mm)	Estimated SAR (W/kg)
BT (DSS)	2.48	6.5	Body-worn	10	0.09

Note:

1. The separation distance is determined from the outer housing of the tablet to the user.
2. When standalone SAR testing is not required, an estimated SAR can be applied to determine simultaneous transmission SAR test exclusion.

<SAR Summation Analysis>

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna. When the sum of SAR_{1g} of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR_{1g} 1.6 W/kg), the simultaneous transmission SAR is not required. When the sum of SAR_{1g} is greater than the SAR limit (SAR_{1g} 1.6 W/kg), SAR test exclusion is determined by the SPLSR.

No.	Conditions (SAR1 + SAR2)	Exposure Condition	Test Position	Max. SAR1	Max. SAR2	SAR Summation	SPLSR Analysis
1	GSM850 + WLAN (DTS)	Head	Right Cheek	0.54	0.69	**1.23**	ΣSAR < 1.6, Not required
			Right Tilted	0.31	0.52	**0.83**	ΣSAR < 1.6, Not required
			Left Cheek	0.48	0.35	**0.83**	ΣSAR < 1.6, Not required
			Left Tilted	0.30	0.29	**0.59**	ΣSAR < 1.6, Not required
		Body-Worn	Front Face	0.51	0.14	**0.65**	ΣSAR < 1.6, Not required
			Rear Face	0.78	0.15	**0.93**	ΣSAR < 1.6, Not required
		Hotspot	Front Face	0.51	0.14	**0.65**	ΣSAR < 1.6, Not required
			Rear Face	0.78	0.15	**0.93**	ΣSAR < 1.6, Not required
			Left Side	0.23	0.07	**0.30**	ΣSAR < 1.6, Not required
			Right Side	0.35	0.03	**0.38**	ΣSAR < 1.6, Not required
			Top Side	0.00	0.13	**0.13**	ΣSAR < 1.6, Not required
			Bottom Side	0.07	0.00	**0.07**	ΣSAR < 1.6, Not required
2	GSM850 + BT (DSS)	Body-Worn	Front Face	0.51	0.09	**0.60**	ΣSAR < 1.6, Not required
			Rear Face	0.78	0.09	**0.87**	ΣSAR < 1.6, Not required

No.	Conditions (SAR1 + SAR2)	Exposure Condition	Test Position	Max. SAR1	Max. SAR2	SAR Summation	SPLSR Analysis
3	GSM1900 + WLAN (DTS)	Head	Right Cheek	0.15	0.69	**0.84**	ΣSAR < 1.6, Not required
			Right Tilted	0.09	0.52	**0.61**	ΣSAR < 1.6, Not required
			Left Cheek	0.36	0.35	**0.71**	ΣSAR < 1.6, Not required
			Left Tilted	0.10	0.29	**0.39**	ΣSAR < 1.6, Not required
		Body-Worn	Front Face	0.80	0.14	**0.94**	ΣSAR < 1.6, Not required
			Rear Face	0.38	0.15	**0.53**	ΣSAR < 1.6, Not required
		Hotspot	Front Face	0.80	0.14	**0.94**	ΣSAR < 1.6, Not required
			Rear Face	0.38	0.15	**0.53**	ΣSAR < 1.6, Not required
			Left Side	0.24	0.07	**0.31**	ΣSAR < 1.6, Not required
			Right Side	0.09	0.03	**0.12**	ΣSAR < 1.6, Not required
			Top Side	0.00	0.13	**0.13**	ΣSAR < 1.6, Not required
			4Bottom Side	0.97	0.00	**0.97**	ΣSAR < 1.6, Not required
4	GSM1900 + BT (DSS)	Body-Worn	Front Face	0.80	0.09	**0.89**	ΣSAR < 1.6, Not required
			Rear Face	0.38	0.09	**0.47**	ΣSAR < 1.6, Not required

No.	Conditions (SAR1 + SAR2)	Exposure Condition	Test Position	Max. SAR1	Max. SAR2	SAR Summation	SPLSR Analysis
5	WCDMA B2 + WLAN (DTS)	Head	Right Cheek	0.34	0.69	**1.03**	ΣSAR < 1.6, Not required
			Right Tilted	0.18	0.52	**0.70**	ΣSAR < 1.6, Not required
			Left Cheek	0.70	0.35	**1.05**	ΣSAR < 1.6, Not required
			Left Tilted	0.46	0.29	**0.75**	ΣSAR < 1.6, Not required
		Body-Worn	Front Face	0.84	0.14	**0.98**	ΣSAR < 1.6, Not required
			Rear Face	0.43	0.15	**0.58**	ΣSAR < 1.6, Not required
		Hotspot	Front Face	0.84	0.14	**0.98**	ΣSAR < 1.6, Not required
			Rear Face	0.43	0.15	**0.58**	ΣSAR < 1.6, Not required
			Left Side	0.29	0.07	**0.36**	ΣSAR < 1.6, Not required
			Right Side	0.11	0.03	**0.14**	ΣSAR < 1.6, Not required
			Top Side	0.00	0.13	**0.13**	ΣSAR < 1.6, Not required
			Bottom Side	1.15	0.00	**1.15**	ΣSAR < 1.6, Not required
6	WCDMA B2 + BT (DSS)	Body-Worn	Front Face	0.84	0.09	**0.93**	ΣSAR < 1.6, Not required
			Rear Face	0.43	0.09	**0.52**	ΣSAR < 1.6, Not required

No.	Conditions (SAR1 + SAR2)	Exposure Condition	Test Position	Max. SAR1	Max. SAR2	SAR Summation	SPLSR Analysis
7	**WCDMA B5 + WLAN (DTS)**	Head	Right Cheek	0.61	0.69	**1.30**	∑SAR < 1.6, Not required
			Right Tilted	0.38	0.52	**0.90**	∑SAR < 1.6, Not required
			Left Cheek	0.56	0.35	**0.91**	∑SAR < 1.6, Not required
			Left Tilted	0.37	0.29	**0.66**	∑SAR < 1.6, Not required
		Body-Worn	Front Face	0.60	0.14	**0.74**	∑SAR < 1.6, Not required
			Rear Face	0.88	0.15	**1.03**	∑SAR < 1.6, Not required
		Hotspot	Front Face	0.60	0.14	**0.74**	∑SAR < 1.6, Not required
			Rear Face	0.88	0.15	**1.03**	∑SAR < 1.6, Not required
			Left Side	0.31	0.07	**0.38**	∑SAR < 1.6, Not required
			Right Side	0.48	0.03	**0.51**	∑SAR < 1.6, Not required
			Top Side	0.00	0.13	**0.13**	∑SAR < 1.6, Not required
			Bottom Side	0.09	0.00	**0.09**	∑SAR < 1.6, Not required
8	**WCDMA B5 + BT (DSS)**	Body-Worn	Front Face	0.60	0.09	**0.69**	∑SAR < 1.6, Not required
			Rear Face	0.88	0.09	**0.97**	∑SAR < 1.6, Not required

Test Engineer：Wiky Zhang

5. Calibration of Test Equipment

Equipment	Manufacturer	Model	SN	Cal. Date	Cal. Interval
System Validation Dipole	SATIMO	SID835	SN 18/11 DIPC 150	Jun. 08, 2017	2 Years
System Validation Dipole	SATIMO	SID1900	SN 18/11 DIPG 153	Jun. 08, 2017	2 Years
System Validation Dipole	SATIMO	SID2450	SN 18/11 DIPJ155	Jun. 08, 2017	2 Years
E-Field Probe	MVG	SSE2	SN 27/15 EPGO262	Jun. 07, 2018	1 Year
MultiMeter	Keithley	Multimate 2000	1331865	Jun. 21, 2018	1 Year
Radio Communication Analyzer	ANRITSU	MT8820C	6201300717	Jul. 24, 2018	1 Year
Wireless Communication Test Set	Agilent	E5515C	MY50260600	Jun. 28, 2018	1 Year
ENA Series Network Analyzer	Agilent	E5071C	MY46214638	Jul. 24, 2018	1 Year
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510355	Jun. 27, 2018	1Year
MXG Analog Signal Generator	KEYSIGHT	N5183A	MY50143024	Mar. 01, 2018	1 Year
Power Meter	Agilent	N1914A	MY52180044	Aug. 12, 2018	2 Years
Power Sensor	Agilent	E9304A H18	MY52050011	Jan. 04, 2018	1 Year
Power Meter	Agilent	ML2495A	1506002	Mar. 01, 2018	1 Year
Power Sensor	Agilent	MA2411B	1339353	Mar. 01, 2018	1 Year
Temp. & Humi. Recorder	CLOCK	HTC-1	157248	Jul. 26, 2018	1 Year
Electronic Thermometer	YONGFA	YF-160A	120100323	Sep. 22, 2018	1 Year
Coupler	Woken	0110A056020-10	COM27RW1A 3	Sep. 20, 2018	1 Year

6. Measurement Uncertainty

Source of Uncertainty	Tolerance (± %)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)	Vi Veff
Measurement System								
Probe Calibration	6.0	N	1	1	1	6.0	6.0	∞
Axial Isotropy	5.9	R	1.732	0.7	0.7	2.4	2.4	∞
Hemispherical Isotropy	12.2	R	1.732	0.7	0.7	4.9	4.9	∞
Boundary Effects	1.0	R	1.732	1	1	0.6	0.6	∞
Linearity	5.9	R	1.732	1	1	3.4	3.4	∞
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6	∞
Readout Electronics	1.0	N	1	1	1	1.0	1.0	∞
Response Time	0.0	R	1.732	1	1	0.0	0.0	∞
Integration Time	2.6	R	1.732	1	1	1.5	1.5	∞
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7	∞
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7	∞
Probe Positioner	1.4	R	1.732	1	1	0.8	0.8	∞
Probe Positioning	1.4	R	1.732	1	1	0.8	0.8	∞
Max. SAR Eval.	2.3	R	1.732	1	1	1.3	1.3	∞
Test Sample Related								
Device Positioning	2.3	N	1	1	1	2.3	2.3	35
Device Holder	2.7	N	1	1	1	2.7	2.7	12
Power Drift	5.0	R	1.732	1	1	2.9	2.9	∞
Power Scaling	0.0	R	1.732	1	1	0.0	0.0	∞
Phantom and Setup								
Phantom Uncertainty	4.0	R	1.732	1	1	2.3	2.3	∞
SAR correction	1.2	R	1.732	1	0.84	0.7	0.6	∞
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0	∞
Liquid Conductivity (mea.)	4.1	R	1.732	0.78	0.71	1.8	1.7	∞
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4	∞
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8	∞
Liquid Permittivity (mea.)	5.0	R	1.732	0.23	0.26	0.7	0.8	∞
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1	∞
Combined Standard Uncertainty (K = 1)						± 11.4 %	± 11.3 %	2923
Expanded Uncertainty (K = 2)						**± 22.7 %**	**± 22.6 %**	

7. Information on the Testing Laboratories

We, BV 7LAYERS COMMUNICATIONS TECHNOLOGY (SHENZHEN) CO. LTD., were founded in 2015 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The road map of all our labs can be found in our web site also.

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Appendix A. SAR Plots of System Verification

The plots for system verification with largest deviation for each SAR system combination are shown as follows.

Appendix B. SAR Plots of SAR Measurement

The SAR plots for highest measured SAR in each exposure configuration, wireless mode and frequency band combination, and measured SAR > 1.5 W/kg are shown as follows.

Appendix C. Calibration Certificate for Probe and Dipole

The MVG calibration certificates are shown as follows.

Appendix D. Photographs of EUT and Setup