FCC SAR Test Report

FCC ID: QISCRO-LX3

Project No.	:	1701C155A
Equipment	:	Smart Phone
Model Name	:	CRO-L03, CRO-L23
Applicant	:	Huawei Technologies Co.,Ltd.
Address	:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District Shenzhen China

Date of Receipt	:	Jan. 18, 2017(CRO-L03) Mar. 15, 2017(CRO-L23)
Date of Test	:	Feb. 04, 2017 ~ Feb. 17, 2017(CRO-L03) Mar. 19, 2017 ~ Mar. 20, 2017(CRO-L23)
Issued Date	:	Mar. 21, 2017
Tested by	:	BTL Inc.

PREPARED BY :

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Testing Laboratory 2640

Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**), or National Institute of Standards and Technology (**NIST**) .

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCC SAR-1-1701C155	Original Issue	Feb. 27, 2017
BTL-FCC SAR-1-1701C155A	Compared with the original report (BTL-FCC SAR-1-1701C155), the differences please see the table below.	Mar. 21, 2017

Note: 1. According to the differences description above, CRO-L23 shares the same test data of CRO-L03 of the same bands. In addition, all the worst cases are evaluated and recorded in this test report.
2. The new added SIM 2 is evaluated and recorded in the test report.
3. For more model difference information, please see the below table.

Project ID	1701C155	1701C155A
Model	CRO-L03	CRO-L23
Brand	HUAWEI	HUAWEI
2G Frequency	GSM/GPRS/EDEG 850//1900	GSM/GPRS/EDEG 850//1900
3G Frequency	UMTS: B2/B5	UMTS: B2/B5
4G Frequency	FDD-LTE:B2/B4/B5/B7	FDD-LTE:B2/B4/B5/B7
Hardware version	The same	The same
Software version	The difference	The difference
SIM Card	Single (Hardware GPIO level is tested by software to identify odd and even cards.)	Double Hardware GPIO level is tested by software to identify odd and even cards. The dual-slot is added through the hardware, others are the same; The only difference between CRO-L03 and CRO-L23 is: CRO-L03 is single SIM point, and the CRO-L23 is double SIM points.
Dimensions	The same	The same
Appearance	The same	The same
main antenna	The same	The same
BT/Wi-Fi antenna	The same	The same
GPS antenna	The same	The same
PA(GSM)	The same	The same
PA(UMTS/FDD)	The same	The same

1. GENERAL SUMMARY

Equipment	Smart Phone
Brand Name	HUAWEI
Model Name	CRO-L03, CRO-L23
Model difference	Pease refer to the note 3 of the section REPORT ISSUED HISTORY.
Manufacturer	Huawei Technologies Co.,Ltd.
Address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District Shenzhen China
Standard(s)	**ANSI Std C95.1-1992** Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.(IEEE Std C95.1-1991) **IEEE Std 1528-2013** Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques **KDB941225 D01** 3G SAR Procedures v03r01 **KDB941225 D05** SAR for LTE Devices v02r05 **KDB941225 D06** Hotspot Mode V02r01 **KDB447498 D01** General RF Exposure Guidance v06 **KDB648474 D04** Handset SAR v01r03 **KDB248227 D01** 802. 11 Wi-Fi SAR v02r02 **KDB865664 D01** SAR measurement 100 MHz to 6 GHz v01r04 **KDB865664 D02** SAR Reporting v01r02 **KDB690783 D01** SAR Listings on Grants v01r03

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCC SAR-1-1701C155A) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

2. RF EMISSIONS MEASUREMENT

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **SAR room** at the location of No.3,Jinshagang 1st Road, ShiXia, Dalang Town,Dong Guan, China.523792

2.2 MEASUREMENT UNCERTAINTY

Note: Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

3. GENERAL INFORMATION

3.1 STATEMENT OF COMPLIANCE

Equipment Class	Mode	Highest Head SAR-1g (W/kg)	Highest Body-worn(15mm) SAR-1g(W/kg)*	Highest Hotspot(10mm) SAR-1g(W/kg)
PCE	GSM850	0.43	0.59	1.17
	GSM1900	0.39	0.30	0.99
	UMTS Band 2	0.39	0.69	1.38
	UMTS Band 5	0.34	0.13	0.29
	LTE Band 2	0.35	0.37	0.93
	LTE Band 4	0.27	0.71	1.24
	LTE Band 5	0.29	0.39	0.43
	LTE Band 7	0.59	0.65	1.17
DTS	2.4G WLAN	0.80	0.16	0.32
Note：The highest reported SAR for head, body-worn accessory, hotspot and simultaneous transmission exposure conditions are 0.80W/kg, 0.71W/kg, 1.38W/kg and 1.51 W/kg respectively.				

Note:
1)* For body-worn operation, this device has been tested and meets FCC RF exposure guidelines when used with any accessory that contains no metal and that positions the handset a minimum of 15mm from the body. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.
2)The device is in compliance with Specific Absorption Rate(SAR)for general population uncontrolled exposure limits according to the FCC rule §2.1093, the ANSI C95.1:1992/IEEE C95.1:1991, the NCRP Report Number 86 for uncontrolled environment, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013 .

3.2 GENERAL DESCRIPTION OF EUT

Equipment	Smart Phone		
Model Name	CRO-L03, CRO-L23		
IMEI Code	CRO-L03	Sample 1: 862555030017537	
		Sample 2: 862555030019301	
	CRO-L23	IMEI 1: 862556030020380	
		IMEI 2: 862556030020389	
S/N	CRO-L03	Sample 1: A6R9KA9710700334	
		Sample 2: A6R9KA9710700511	
	CRO-L23	9AH9KA9710900119	
HW Version	HL1CROM		
SW Version	CRO-L03	Cairo-L03C469B015	
	CRO-L23	Cairo-L23C469B022	
Modulation	GSM(GMSK/8PSK),UMTS(QPSK/16QAM),LTE(QPSK/16QAM),WiFi (DSSS/OFDM),BT(GFSK/ π /4-DQPSK/8-DPSK)		
Operation Frequency Range(s)	Band	TX (MHz)	RX (MHz)
	GSM850	824-849	869-894
	GSM1900	1850-1910	1930-1990
	UMTS Band 2	1850-1910	1930-1990
	UMTS Band 5	824-849	869-894
	LTE Band 2	1850-1910	1930-1990
	LTE Band 4	1710-1755	2110-2155
	LTE Band 5	824-849	869-894
	LTE Band 7	2500-2570	2620-2690
	Bluetooth	2400 -2483.5	
	2.4GWIFI	2400 -2483.5	
GPRS/EDGE Multislot Class(12)	Max Number of Timeslots in Uplink:	4	
	Max Number of Timeslots in Downlink:	4	
	Max Total Timeslot:	5	
GSM Device class	Class B		
HSDPA UE Category	14		
HSUPA UE Category	7		
DC-HSDPA UE Category	24		
Power Class:	4,tested with power level 5(GSM850)		
	1,tested with power level 0(GSM1900)		
	3, tested with power control “all 1”(UMTS Band 2/5)		
	3, tested with power control “all Max” (LTE Band 2/4/5/7)		
Test Channels (low-mid-high):	128-190-251 (GSM850)		
	512-661-810 (GSM1900)		
	9262-9400-9538(UMTS Band 2)		
	4132-4182-4233 (UMTS Band 5)		
	18700-18900-19100(LTE Band 2 BW=20MHz)		
	20050-20175-20300(LTE Band 4 BW=20MHz)		
	20450-20525-20600(LTE Band 5 BW=10MHz)		
	20850-21100-21350(LTE Band 7 BW=20MHz)		
	1-6 -11 (2.4G WIFI 802.11b/g/n HT20)		
	3-6 - 9 (2.4G WIFI 802.11n HT40)		
Other Information			

Battery	Huawei Technologies Co., Ltd. Battery Model: HB3742A0EZC+ Rated capacity: 2200mAh Nominal Voltage: ⎓ +3.8V Charging Voltage: ⎓ +4.35V 1.SCUD (FUJIAN) Electronics Co., Ltd 2.Shenzhen Desay Battery Tech Co., Ltd.
With Earphone(Yes/No)	Yes

3.3 LABORATORY ENVIRONMENT

Temperature	Min. = 18ºC, Max. = 25ºC
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

3.4 MAIN TEST INSTRUMENTS

Item	Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Interval
1	Data Acquisition Electronics	Speag	DAE4	1390	Sep. 22, 2016	1 Year
2	E-field Probe	Speag	EX3DV4	3932	Feb. 19, 2016	1 Year
3	E-field Probe	Speag	EX3DV4	7340	Dec. 27, 2016	1 Year
4	System Validation Dipole	Speag	D835V2	4d160	Sep. 30, 2015	3 Years
5	System Validation Dipole	Speag	D1750V2	1101	Sep. 22, 2015	3 Years
6	System Validation Dipole	Speag	D1900V2	5d179	Sep. 29, 2015	3 Years
7	System Validation Dipole	Speag	D2450V2	919	Sep. 28, 2015	3 Years
8	System Validation Dipole	Speag	D2600V2	1067	Sep. 28, 2015	3 Years
9	Twin Sam Phantom	Speag	Twin Sam Phantom V5.0	1784	N/A	N/A
10	Twin Sam Phantom	Speag	Twin Sam Phantom V5.0	1896	N/A	N/A
11	8960 Series 10 Wireless Com Test set	Agilent	E5515E	MY52112163	Sep. 04, 2016	1 Year
12	CMW500-Wideband Radio Communication Tester	RS	CMW500	152366	Mar. 27, 2016	1 Year
13	CMW500-Wideband Radio Communication Tester	RS	CMW500	152372	Mar. 27, 2016	1 Year
14	Power Amplifier	Mini-Circuits	ZHL-42W+	QA1333003	N/A	N/A
15	ENA Network Analyzer	Agilent	E5071C	MY46102965	Mar. 27, 2016	1 Year
16	MXG Analog Signal Generator	Agilent	N5181A	MY49060710	Sep. 04, 2016	1 Year
17	P-series power meter	Agilent	N1911A	MY45100473	Sep. 04, 2016	1 Year
18	wideband power sensor	Agilent	N1921A	MY51100041	Sep. 04, 2016	1 Year
19	power Meter	Anritsu	ML2495A	1128009	Mar. 27, 2016	1 Year
20	Pulse Power Sensor	Anritsu	MA 2411B	1027500	Mar. 27, 2016	1 Year
21	Dielectric Assessment Kit	Speag	DAK-3.5	1226	N/A	N/A
22	Dual directional coupler	Woken	TS-PCC0M-05	107090019	Mar. 16, 2016	1 Year
23*	Dual directional coupler	Woken	TS-PCC0M-05	107090019	Mar. 09, 2017	1 Year

Remark: 1.” N/A” denotes no model name, serial No. or calibration specified.

2. 1) Per KDB865664 D01 requirements for dipole calibration, the test laboratory has adopted three-year extended calibration interval. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.

a) There is no physical damage on the dipole;

b) System check with specific dipole is within 10% of calibrated value;

c) The most recent return-loss result , measured at least annually, deviates by no more than 20% from the previous measurement;

d) The most recent measurement of the real or imaginary parts of the impedance, measured at least annually is within 5 Ω from the previous measurement.

2) Network analyzer probe calibration against air, distilled water and a short block performed before measuring liquid parameters.

3. * The test equipment recalibrated between different test periods were within the valid period when the tests were performed.

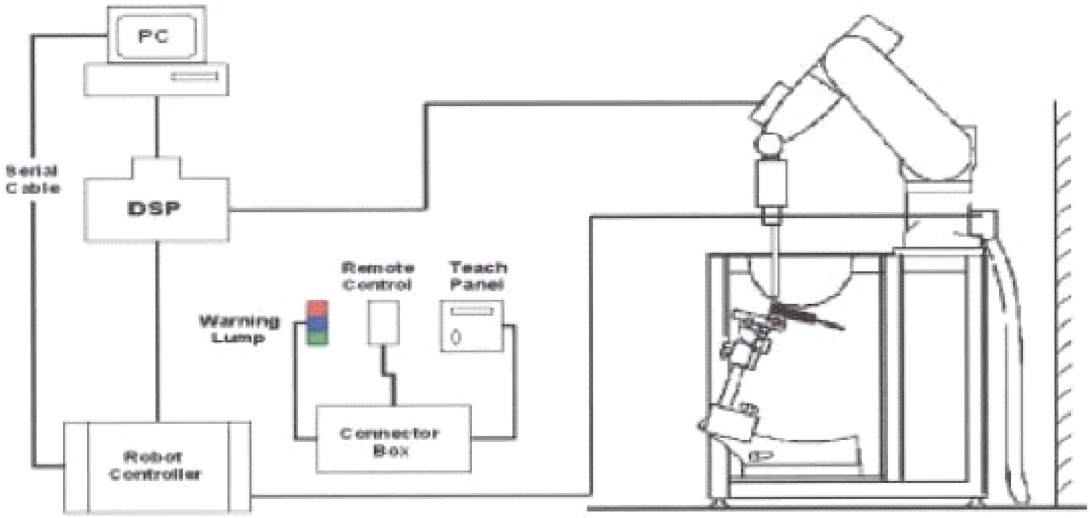
4.SAR MEASUREMENTS SYSTEM CONFIGURATION

4.1SAR MEASUREMENT SET-UP

The DASY5 system for performing compliance tests consists of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
3. A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
4. A unit to operate the optical surface detector which is connected to the EOC.
5. The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.
6. TheDASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 7
7. DASY5 software and SEMCAD data evaluation software.
8. Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling the testing of left-hand and right-hand usage.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.
12. System validation dipoles allowing to validate the proper functioning of the system.

4.1.1Test Setup Layout



4.2 DASY5E-FIELDPROBESYSTEM

The SAR measurements were conducted with the dosimetric probe EX3DV4(manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

4.2.1EX3DV4 PROBE SPECIFICATION

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 μW/g to > 100 mW/g Linearity:± 0.2dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Distance from probe tip to dipole centers: 1.0 mm

EX3DV4 E-field Probe

4.2.2E-FIELD PROBE CALIBRATION

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ±10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a wave guide 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 then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

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

Where: Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

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

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m3).

4.2.3OTHER TEST EQUIPMENT

4.2.3.1. Device Holder for Transmitters

Construction: Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices (e.g., laptops, cameras, etc.) It is light weight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin SAM, ELI4and SAM v6.0Phantoms.
Material: POM, Acrylic glass, Foam

4.2.3.2 Phantom

Model	ELI4 Phantom
Construction	Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI 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 three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.
Shell Thickness	2±0.1 mm
Filling Volume	Approx. 30 liters
Dimensions	Length: 600 mm ; Width: 190mm Height: adjustable feet
Aailable	Special

Model	Twin SAM
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 three points with the robot.
Shell Thickness	2 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Length:1000mm; Width: 500mm Height: adjustable feet
Aailable	Special

4.2.4SCANNING PROCEDURE

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max. ± 5 %.

The “surface check” measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

- Area Scan

The “area scan” measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strength is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The standard scan uses large grid spacing for faster measurement. Standard grid spacing for head measurements is 15 mm in x- and y- dimension(≤2GHz)，12 mm in x- and y- dimension(2-4 GHz) and 10mm in x- and y- dimension(4-6GHz). If a finer resolution is needed, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation.

- Zoom Scan

A “zoom scan” measures the field in a volume around the 2D peak SAR value acquired in the previous “coarse” scan. This is a fine grid with maximum scan spatial resolution: Δx_{zoom}, $\Delta y_{zoom} \leq$ 2GHz -≤8mm, 2-4GHz -≤5 mm and 4-6 GHz-≤4mm; $\Delta z_{zoom} \leq$3GHz -≤5 mm, 3-4 GHz-≤4mm and 4-6GHz-≤2mm where the robot additionally moves the probe along the z-axis away from the bottom of the Phantom. DASY is also able to perform repeated zoom scans if more than 1 peak is found during area scan. In this document, the evaluated peak 1g and 10g averaged SAR values are shown in the 2D-graphics in Appendix B. Test results relevant for the specified standard (see chapter 1.4.)are shown in table form form in chapter 7.2.

A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 2 mm steps. This measurement shows the continuity of the liquid and can - depending in the field strength – also show the liquid depth.

The following table summarizes the area scan and zoom scan resolutions per FCC KDB 865664D01:

Frequency	Maximun Area Scan resolution (Δx_{area}, Δy_{area})	Maximun Zoom Scan spatial resolution (Δx_{Zoom}, Δy_{Zoom})	Maximun Zoom Scan spatial resolution			Minimum zoom scan volume (x,y,z)
			Uniform Grid	Graded Grad		
			$\Delta z_{Zoom}(n)$	$\Delta z_{Zoom}(1)$*	$\Delta z_{Zoom}(n>1)$*	
≤2GHz	≤15mm	≤8mm	≤5mm	≤4mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥30mm
2-3GHz	≤12mm	≤5mm	≤5mm	≤4mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥30mm
3-4GHz	≤12mm	≤5mm	≤4mm	≤3mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥28mm
4-5GHz	≤10mm	≤4mm	≤3mm	≤2.5mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥25mm
5-6GHz	≤10mm	≤4mm	≤2mm	≤2mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥22mm

4.2.5SPATIAL PEAK SAR EVALUATION

The spatial peak SAR - value for 1 and 10 g is evaluated after the Cube measurements have been done. The basis of the evaluation are the SAR values measured at the points of the fine cube grid consisting of 5 x 5 x 7 points(with 8mm horizontal resolution) or 7 x 7 x 7 points(with 5mm horizontal resolution) or 8 x 8 x 7 points(with 4mm horizontal resolution). The algorithm that finds the maximal averaged volume is separated into three different stages.

- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting “Graph Evaluated”.
- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.
- All neighboring volumes are evaluated until no neighboring volume with a higher average value is found.

Extrapolation

The extrapolation is based on a least square algorithm [W. Gander, Computermathematik, p.168-180]. Through the points in the first 3 cm along the z-axis, polynomials of order four are calculated. These polynomials are then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1 mm from each other.

Interpolation

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a knot"-condition [W. Gander, Computermathematik, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff].

Volume Averaging

At First the size of the cube is calculated. Then the volume is integrated with the trapezoidal algorithm. 8000 points (20x20x20) are interpolated to calculate the average.

Advanced Extrapolation

DASY5 uses the advanced extrapolation option which is able to compansate boundary effects on E-field probes.

4.2.6DATA STORAGE AND EVALUATION

4.2.5.1Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DAE4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

4.2.7 Data Evaluation by SEMCAD

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	Sensitivity	Normi, a_{i0}, a_{i1}, a_{i2}
	Conversion factor	$ConvF_i$
	Diode compression point	Dcp_i
Device parameters:	Frequency	f
	Crest factor	cf
Media parameters:	Conductivity	
	Density	

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multi meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot cf / dcp_i$$

With
V_i = compensated signal of channel i (i = x, y, z)
U_i = input signal of channel i (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp_i = diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes: $E_i = (V_i \,/\, Norm_i \cdot ConvF \,)^{1/2}$

H-field probes: $H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2) \,/\, f$

With V_i = compensated signal of channel i (i = x, y, z)

$Norm_i$ = sensor sensitivity of channel i (i = x, y, z)
[mV/(V/m)^2] for E-field Probes

ConvF = sensitivity enhancement in solution

aij = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

E_i = electric field strength of channel i in V/m

H_i = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = (E_X{}^2 + E_Y{}^2 + E_Z{}^2)^{1/2}$$

The primary field data are used to calculate the derived field units.

$$SAR = (E_{tot})^2 \cdot \sigma \,/\, (\rho \cdot 1000)$$

With SAR = local specific absorption rate in mW/g

E_{tot} = total field strength in V/m
= conductivity in [mho/m] or [Siemens/m]
= equivalent tissue density in g/cm^3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = E_{tot}{}^2 \,/\, 3770 \text{ or } P_{pwe} = H_{tot}{}^2 \cdot 37.7$$

With P_{pwe} = equivalent power density of a plane wave in mW/cm^2

E_{tot} = total field strength in V/m

H_{tot} = total magnetic field strength in A/m

5. SYSTEM VERIFICATION PROCEDURE

5.1 TISSUE VERIFICATION

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectic parameter are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within ± 5% of the target values.

The following materials are used for producing the tissue-equivalent materials.

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
Head 835	0.2	-	0.2	1.5	57.0	-	41.1	-
Head 1750	-	47.0	-	0.4	-	-	52.6	-
Head 1900	-	44.5	-	0.2	-	-	55.3	-
Head 2450	-	45.0	-	0.1	-	-	54.9	-
Head 2600	-	45.1	-	0.1	-	-	54.8	-

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
Body 835	0.2	-	0.2	0.9	48.5	-	50.2	-
Body 1750	-	31.0	-	0.2	-	-	68.8	-
Body 1900	-	29.5	-	0.3	-	-	70.2	-
Body 2450	-	31.4	-	0.1	-	-	68.5	-
Body 2600	-	31.8	-	0.1	-	-	68.1	-

Salt: 99+% Pure Sodium Chloride; Sugar: 98+% Pure Sucrose; Water: De-ionized, 16M + resistivity
HEC: Hydroxyethyl Cellulose; DGBE: 99+% Di(ethylene glycol) butyl ether,[2-(2-butoxyethoxy)ethanol]
Triton X-100(ultra pure): Polyethylene glycol mono [4-(1,1,3,3-tetramethylbutyl)phenyl]ether

Tissue Verification									
Tissue Type	Frequency (MHz)	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (εr)	Targeted Conductivity (σ)	Targeted Permittivity (εr)	Deviation Conductivity (σ) (%)	Deviation Permittivity (εr) (%)	Date
Head	835	22.4	0.912	43.080	0.90	41.5	1.33	3.81	Feb. 06, 2017
Head	835	22.6	0.905	41.360	0.90	41.5	0.56	-0.34	Mar. 19, 2017
Head	1750	22.3	1.355	40.800	1.37	40.1	-1.09	1.75	Feb. 08, 2017
Head	1750	22.6	1.368	40.690	1.37	40.1	-0.15	1.47	Mar. 19, 2017
Head	1900	22.5	1.383	38.870	1.40	40.0	-1.21	-2.83	Feb. 07, 2017
Head	1900	22.6	1.420	40.450	1.40	40.0	1.43	1.13	Mar. 19, 2017
Head	2450	22.5	1.872	38.860	1.80	39.2	4.00	-0.87	Feb. 09, 2017
Head	2450	22.6	1.883	38.890	1.80	39.2	4.61	-0.79	Mar. 19, 2017
Head	2600	22.5	2.051	37.610	1.96	39.0	4.64	-3.56	Feb. 07, 2017
Head	2600	22.6	2.054	37.500	1.96	39.0	4.80	-3.85	Mar. 19, 2017
Body	835	22.1	0.992	55.460	0.97	55.2	2.27	0.47	Feb. 05, 2017
Body	835	22.3	0.982	55.610	0.97	55.2	1.24	0.74	Feb. 08, 2017
Body	835	22.6	0.986	55.530	0.97	55.2	1.65	0.60	Mar. 19, 2017
Body	1750	22.1	1.481	52.640	1.49	53.4	-0.60	-1.42	Feb. 10, 2017
Body	1750	22.3	1.487	52.710	1.49	53.4	-0.20	-1.29	Mar. 20, 2017
Body	1900	22.3	1.553	51.950	1.52	53.3	2.19	-2.53	Feb. 04, 2017
Body	1900	22.3	1.547	51.970	1.52	53.3	1.78	-2.50	Feb. 08, 2017
Body	1900	22.6	1.553	54.470	1.52	53.3	2.17	2.20	Mar. 19, 2017
Body	2450	22.1	1.972	51.340	1.95	52.7	1.13	-2.58	Feb. 10, 2017
Body	2450	22.3	1.992	51.580	1.95	52.7	2.15	-2.13	Mar. 20, 2017
Body	2600	22.3	2.194	52.420	2.16	52.5	1.57	-0.15	Feb. 17, 2017
Body	2600	22.6	2.192	52.440	2.16	52.5	1.48	-0.11	Mar. 19, 2017

Note:
1)The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 °C of the conditions expected during the SAR evaluation to satisfy protocol requirements.
2)KDB 865664 was ensured to be applied for probe calibration frequencies greater than or equal to 50MHz of the EUT frequencies.
3)The above measured tissue parameters were used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies. The SAR test plots may slightly differ from the table above since the DASY rounds to three significant digits.

5.2 SYSTEM CHECK

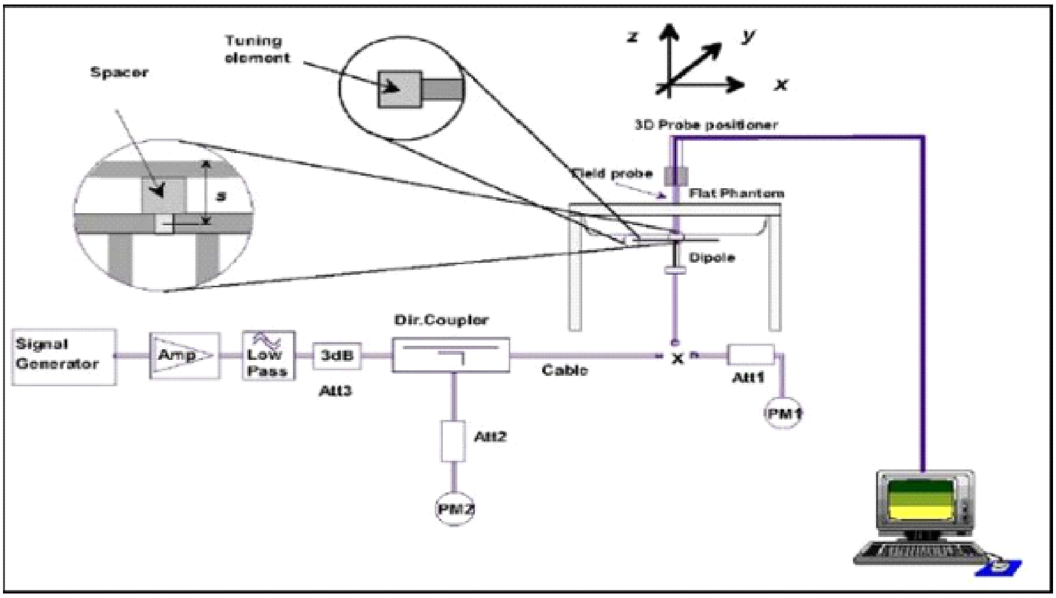
The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system check is performed with tissue equivalent material according to IEEE P1528 (described above). The following table shows system check results for all frequency bands and tissue liquids used during the tests.

System Check	Date	Frequency (MHz)	Targeted SAR-1g (W/kg)	Measured SAR-1g (W/kg)	normalized SAR-1g (W/kg)	Deviation (%)	Dipole S/N
Head	Feb. 06, 2017	835	9.50	2.42	9.68	1.89	4d160
Head	Mar. 19, 2017	835	9.50	2.41	9.64	1.47	4d160
Head	Feb. 08, 2017	1750	36.60	8.58	34.32	-6.23	1101
Head	Mar. 19, 2017	1750	36.60	8.84	35.36	-3.39	1101
Head	Feb. 07, 2017	1900	39.70	9.65	38.60	-2.77	5d179
Head	Mar. 19, 2017	1900	39.70	9.79	39.16	-1.36	5d179
Head	Feb. 09, 2017	2450	52.00	13.50	54.00	3.85	919
Head	Mar. 19, 2017	2450	52.00	13.40	53.60	3.08	919
Head	Feb. 07, 2017	2600	56.80	13.90	55.60	-2.11	1067
Head	Mar. 19, 2017	2600	56.80	13.93	55.72	-1.90	1067
Body	Feb. 05, 2017	835	9.52	2.31	9.24	-2.94	4d160
Body	Feb. 08, 2017	835	9.52	2.33	9.32	-2.10	4d160
Body	Mar. 19, 2017	835	9.52	2.36	9.44	-0.84	4d160
Body	Feb. 10, 2017	1750	35.70	8.73	34.92	-2.18	1101
Body	Mar. 20, 2017	1750	35.70	8.85	35.40	-0.84	1101
Body	Feb. 04, 2017	1900	39.60	9.84	39.36	-0.61	5d179
Body	Feb. 08, 2017	1900	39.60	9.94	39.76	0.40	5d179
Body	Mar. 19, 2017	1900	39.60	9.85	39.40	-0.51	5d179
Body	Feb. 10, 2017	2450	51.10	11.90	47.60	-6.85	919
Body	Mar. 20, 2017	2450	51.10	12.80	51.20	0.20	919
Body	Feb. 17, 2017	2600	54.10	13.30	53.20	-1.66	1067
Body	Mar. 19, 2017	2600	54.10	12.80	51.20	-5.36	1067

5.3 SYSTEM CHECK PROCEDURE

The system check is performed by using a system check dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a plexiglass spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 250 mW(below 5GHz) or 100mW(above 5GHz). To adjust this power a power meter is used. The power sensor is connected to the cable before the system check to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the system check to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test.

System check results have to be equal or near the values determined during dipole calibration (target SAR in table above) with the relevant liquids and test system (±10 %).



6.SAR MEASUREMENT VARIABILITY AND UNCERTAINTY

6.1SAR MEASUREMENT VARIABILITY

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The 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.

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.

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

The detailed repeated measurement results are shown in Section 8.2.

7. OPERATIONAL CONDITIONS DURING TEST

7.1 SAR TEST CONFIGURATION

7.1.1 GSM TEST CONFIGURATION

SAR tests for GSM850 and GSM1900, a communication link is set up with a base station by air link. Using 8960 Series the power lever is set to “5”and “0” in SAR of GSM850 and GSM1900. The tests in the band of GSM850 and GSM1900 are performed in the mode of GPRS/EGPRS function. Since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5. The EGPRS class is 12 for this EUT, it has at most 4 timeslots in uplink, and at most 4 timeslots in downlink, the maximum total timeslot is 5.

When SAR tests for EGPRS mode is necessary, GMSK modulation should be used to minimize SAR measurement error due to higher peak-to-average power (PAR) ratios inherent in 8PSK.

According to specification 3GPP TS 51.010, the maximum power of the GSM can do the power reduction for the multi-slot.

The allowed power reduction in the multi-slot configuration is as following:

Number of timeslots in uplink assignment		Reduction of maximum output power (dB)			
Band	Time Slots	GPRS (GMSK)	EGPRS (GMSK)	EGPRS (8PSK)	
GSM850	1 TX slot	0	0	0	
	2 TX slots	0.5	0.5	1	
	3 TX slots	2.5	2.5	3	
	4 TX slots	3.5	3.5	4	
GSM1900	1 TX slot	0	0	0	0
	2 TX slots	1	1	1	1
	3 TX slots	3.5	3.5	3	3
	4 TX slots	4.5	4.5	4	4

7.1.2 UMTS TEST CONFIGURATION

1. Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the procedures description in section 5.2 of 3GPP TS 34.121,using the appropriate RMC or AMR with TPC(transmit power control) set to all “1s” for WCDMA/HSDPA or by applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Result for all applicable physical channel configurations(DPCCH,DPDCHn and spreading codes, HSDPA, HSPA)
Should be tabulated in the SAR report .All configuration that are not supported by the DUT or cannot be measured due to technical or equipment limitation should be clearly identified.

2. WCDMA

(1).Head SAR Measurements
SAR for next to ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all “1s”. The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for 12.2 kbps AMR with 3.4kbps SRB(signaling radio bearer) using the highest reported SAR configuration in 12.2 kbps RMC for head exposure.

(2).Body SAR Measurements
SAR for body-worn accessory is measured using the 12.2 kbps RMC with the TPC bits configured to all “1s”. The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by handset with 12.2 kbps RMC as the primary mode.

3. HSDPA

SAR for body exposure configurations is measured according to the “Body SAR Measurements” procedures of 3G device. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤世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 ≤ 1.2W/kg, SAR measurement is not required for the secondary mode. This is referred to as the 3G SAR test reduction procedure in the following SAR test guidance, where the primary mode is identified in the applicable wireless mode test procedures and the secondary mode is wireless mode being considered for SAR test reduction by that procedure. When the 3G SAR test reduction procedure is not satisfied, it is identified as “otherwise” in the applicable procedures; SAR measurement is required for the secondary mode.

Per KDB941225 D01, the 3G SAR test reduction procedure is applied to HSDPA body configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSDPA using the HSDPA body SAR procedures for the highest reported SAR body exposure configuration in 12.2 kbps RMC.

HSDPA should be configured according to UE category of a test device. The number of HS-DSCH/HS-PDSCHs, HAPRQ 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 condition, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. The β_c and β_d gain factors for DPCCH and DPDCH were set according to the values in the below table, β_{hs} for HS-DPCCH is set automatically to the correct value when △ACK, △NACK, △CQI = 8. The variation of the β_c / β_d ratio causes a power reduction at sub-tests 2 - 4.

Sub-test	β_c	β_d	β_d (SF)	β_c / β_d	β_{hs} (1)	CM(dB)(2)	MPR (dB)
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: △ACK, △NACK and △CQI = 8 $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$ Note 2 : CM=1 for β_c/β_d = 12/15, β_{hs}/β_c = 24/15. For all other combinations of DPDCH,DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases. 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 signalled gain factors for the reference TFC (TF1,TF1) to β_c = 11/15 and β_d = 15/15							

The measurements were performed with a Fixed Reference Channel (FRC) and H-Set 1 QPSK.

Settings of required H-Set 1 QPSK acc. to 3GPP 34.121

Parameter	Value
Nominal average inf. bit rate	534 kbit/s
Inter-TTI Distance	3 TTI"s
Number of HARQ Processes	2 Processes
Information Bit Payload	3202 Bits
MAC-d PDU size	336 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	4800 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	9600 SMLs
Coding Rate	0.67
Number of Physical Channel Codes	5

HSDPA UE category

HS-DSCH Category	Maximum HS-DSCH Codes Received	Minimum Inter-TTI Interval	Maximum HS-DSCH Transport Block Bits/HS-DSCH TTI	Total Soft Channel Bits
1	5	3	7298	19200
2	5	3	7298	28800
3	5	2	7298	28800
4	5	2	7298	38400
5	5	1	7298	57600
6	5	1	7298	67200
7	10	1	14411	115200
8	10	1	14411	134400
9	15	1	25251	172800
10	15	1	27952	172800
11	5	2	3630	14400
12	5	1	3630	28800
13	15	1	34800	259200
14	15	1	42196	259200
15	15	1	23370	345600
16	15	1	27952	345600

4. HSUPA

SAR for Body exposure configurations is measured according to the "Body SAR Measurements" procedures of 3G device. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤¼ 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 ≤ 1.2W/kg, SAR measurement is not required for the secondary mode.

Per KDB941225 D01, the 3G SAR test reduction procedures is applied to HSPA (HSUPA/HSDPA with RMC) body configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSPA using the HSPA body SAR procedures for the highest reported body exposure SAR configuration in 12.2 kbps RMC.

Due to inner loop power control requirements in HSUPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSDPA should be configured according to the values indicated below as well as other applicable procedures described in the "WCDMA Handset" and „Release 5 HSDPA Data Device" sections of 3G device.

Subtests for WCDMA Release 6 HSUPA

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	β_{ec}	β_{ed}	β_{ec} (SF)	β_{ed} (code)	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: ΔACK, ΔNACK and ΔCQI = 8 $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. 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 signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$

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 signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$

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} can not be set directly; it is set by Absolute Grant Value.

HSUPA UE category

<table>
<tr><th>UE E-DCH Category</th><th>Maximum E-DCH Codes Transmitted</th><th>Number of HARQ Processes</th><th>E-DCH TTI(ms)</th><th>Minimum Speading Factor</th><th>Maximum E-DCH Transport Block Bits</th><th>Max Rate (Mbps)</th></tr>
<tr><td>1</td><td>1</td><td>4</td><td>10</td><td>4</td><td>7110</td><td>0.7296</td></tr>
<tr><td rowspan="2">2</td><td>2</td><td>8</td><td>2</td><td>4</td><td>2798</td><td rowspan="2">1.4592</td></tr>
<tr><td>2</td><td>4</td><td>10</td><td>4</td><td>14484</td></tr>
<tr><td>3</td><td>2</td><td>4</td><td>10</td><td>4</td><td>14484</td><td>1.4592</td></tr>
<tr><td rowspan="2">4</td><td>2</td><td>8</td><td>2</td><td>2</td><td>5772</td><td>2.9185</td></tr>
<tr><td>2</td><td>4</td><td>10</td><td>2</td><td>20000</td><td>2.00</td></tr>
<tr><td>5</td><td>2</td><td>4</td><td>10</td><td>2</td><td>20000</td><td>2.00</td></tr>
<tr><td rowspan="2">6
(No DPDCH)</td><td>4</td><td>8</td><td>10</td><td rowspan="2">2SF2&2SF4</td><td>11484</td><td>5.76</td></tr>
<tr><td>4</td><td>4</td><td>2</td><td>20000</td><td>2.00</td></tr>
<tr><td rowspan="2">7
(No DPDCH)</td><td>4</td><td>8</td><td>2</td><td rowspan="2">2SF2&2SF4</td><td>22996</td><td>?</td></tr>
<tr><td>4</td><td>4</td><td>10</td><td>20000</td><td>?</td></tr>
</table>

NOTE: When 4 codes are transmitted in parallel, two codes shall be transmitted with SF2 and two with SF4.UE categories 1 to 6 support QPSK only. UE category 7 supports QPSK and 16QAM.(TS25.306-7.3.0).

5. DC-HSDPA

SAR is required for Rel. 8 DC-HSDPA when SAR is required for Rel.5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a Second serving HS-DSCH cell are required to perform the power measurement and for the results to be acceptable.

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS 34.108 v9.5.0. A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0
Levels for HSDPA connection setup

Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH _Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13
The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.
The measurements were performed with a Fixed Reference Channel (FRC) H-Set 12 with QPSK

Parameter	Value
Nominal average inf. bit rate	60 kbit/s
Inter-TTI Distance	1 TTI"s
Number of HARQ Processes	6 Processes
Information Bit Payload	120 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	960 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	3200 SMLs
Coding Rate	0.15
Number of Physical Channel Codes	1

Note:
1.The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table above.
2.Maximum number of transmission is limited to 1,i.e.,retransmission is not allowed. The redundancy and constellation version 0 shall be used.

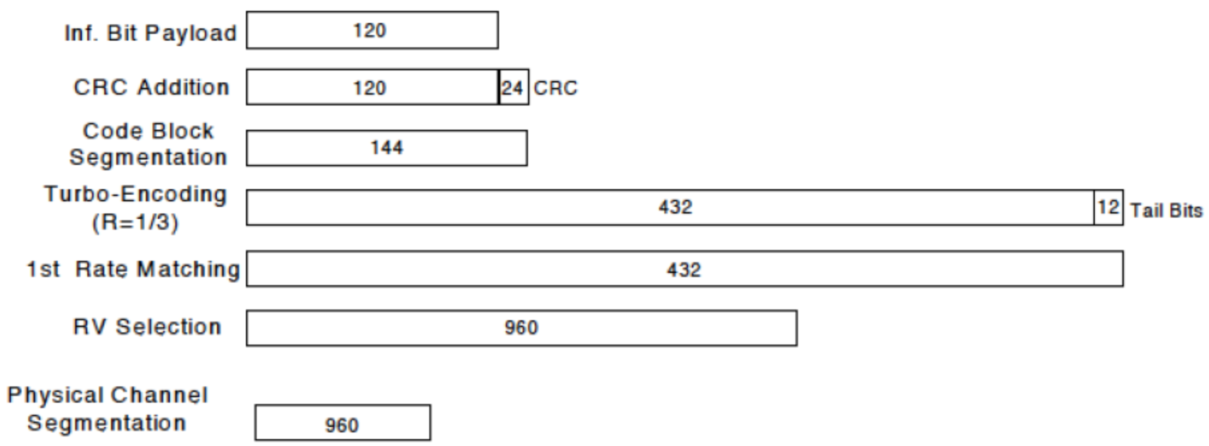


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

The following 4 Sub-tests for HSDPA were completed according to Release 5 procedures. A summary of subtest settings are illustrated below:

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	CM(dB)(2)	MPR (dB)
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 $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$
Note 2 : CM=1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.
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 signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$

Up commands are set continuously to set the UE to Max power.

Note:
1.The Dual Carriers transmission only applies to HSDPA physical channels
2.The Dual Carriers belong to the same Node and are on adjacent carriers.
3.The Dual Carriers do not support MIMO to serve UEs configured for dual cell operation
4.The Dual Carriers operate in the same frequency band .
5.The device doesn't support the modulation of 16QAM in uplink but 64QAM in downlink for DC-HSDPA mode.
6.The device doesn"t support carrier aggregation for it just can operate in Release 8.

6. HSPA+

Per KDB941225 D01, SAR is required for Rel. 7 HSPA+ when SAR is required for Rel. 6 HSPA; otherwise, the 3G SAR test reduction procedure is applied to (uplink) HSPA+ with 12.2 kbps RMC as the primary mode. Power is measured for HSPA+ that supports uplink 16 QAM according to configurations in Table C.11.1.4 of 3GPP TS 34.121-1 to determine SAR test reduction.

When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤¼ dB higher than the primary mode, SAR measurement is not required for the secondary mode.

Table Sub-test1 setup for release 7 HSPA+ with 16QAM

Sub-test	β_c *(Note3)*	β_d	β_{HS} *(Note1)*	β_{ec}	β_{ed} (2xSF2) *(Note 4)*	β_{ed} (2xSF4) *(Note 4)*	CM (dB) *(Note 2)*	MPR (dB) *(Note 2)*	*AG Index (Note 4)*	*E-TFCI (Note 5)*	*E-TFCI (boost)*
1	1	0	30/15	30/15	β_{ed}1: 30/15 β_{ed}2: 30/15	β_{ed}3: 24/15 β_{ed}4: 24/15	3.5	2.5	14	105	105

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c .
Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).
Note 3: DPDCH is not configured, therefore the β_c is set to 1 and β_d = 0 by default.
Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.
Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signalled to use the extrapolation algorithm.

7.1.3 LTE TEST CONFIGURATION

SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices. The CMW500 Wide Band Radio Communication Tester was used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR test were performed with the same number of RB and RB offsets transmitting on all TTI frames(Maximum TTI)

1. Spectrum Plots for RB configurations

A properly configured base station simulator was used for LTE output power measurements and SAR testing. Therefore, spectrum plots for RB configurations were not required to be included in this report.

2. MPR

When MPR is implemented permanently within the UE, regardless of network requirements, only those RB configurations allowed by 3GPP for the channel bandwidth and modulation combinations may be tested with MPR active. Configurations with RB allocations less than the RB thresholds required by 3GPP must be tested without MPR.
The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101:

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

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

3. A-MPR

A-MPR(Additional MPR) has been disabled for all SAR tests by using Network Signalling Value of "NS_01"on the base station simulator.

4. LTE procedures for SAR testing

A) Largest channel bandwidth standalone SAR test requirements

i) QPSK with 1 RB allocation

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

ii) QPSK with 50% RB allocation

The procedures required for 1 RB allocation in i) are applied to measure the SAR for QPSK with 50% RB allocation

iii) QPSK with 100% RB allocation

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in i) and ii) 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.

iv) Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections 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.

B) Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

7.1.4 WIFI TEST CONFIGURATION

For WLAN SAR testing, WLAN engineering testing software installed on the DUT can provide continuous transmitting RF signal.

2.4G

Mode	802.11b	802.11g	802.11n HT20	802.11n HT40
Duty cycle	100%			
Crest factor	1			

For WiFi SAR testing, a communication link is set up with the test mode software for WiFi mode test. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. The RF signal utilized in SAR measurement has 100% duty cycle and its crest factor is 1. The test procedures in KDB 248227 D01 are applied.

7.1.4.1 2.4G SAR Test Requirements

802.11b DSSS SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
2) 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.

2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied. SAR is not required for the following 2.4 GHz OFDM conditions.

1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
2) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

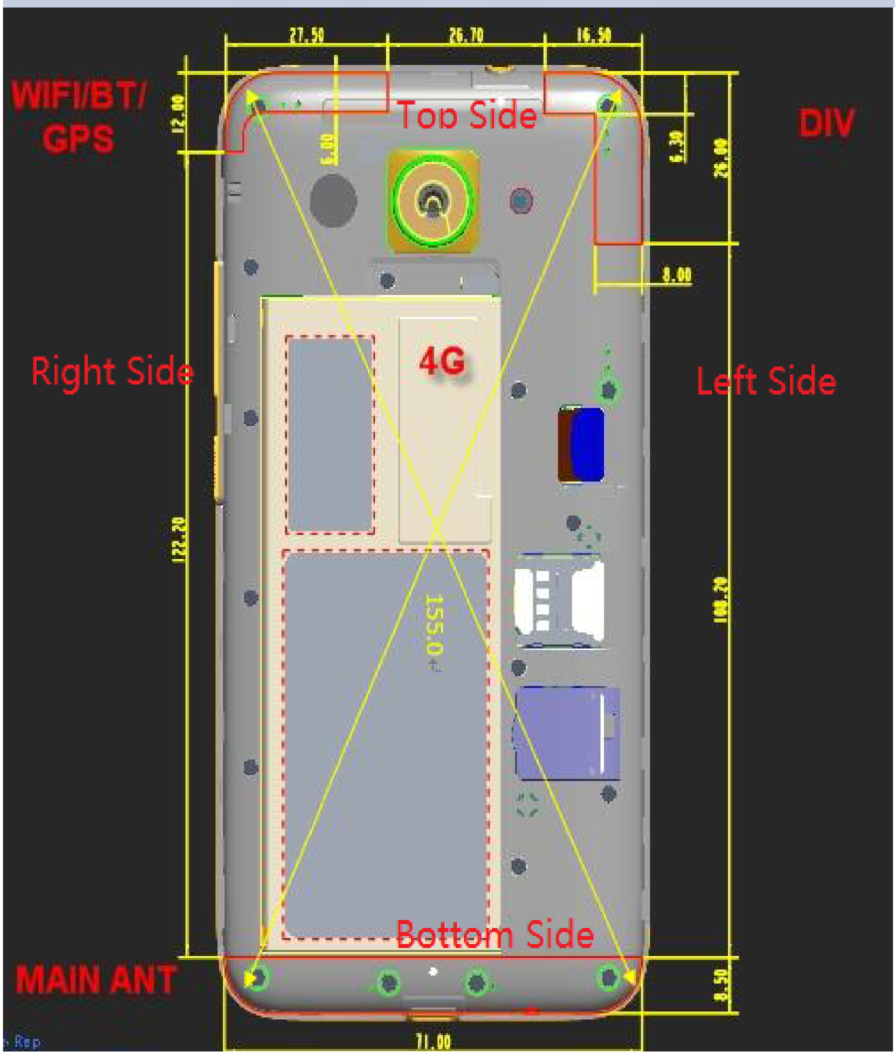
7.2 TEST POSITION

7.2.1 Head

Measurements were made in “cheek” and “tilt” positions on both the left hand and right hand sides of the phantom.

7.2.2 Body

The location of the antennas inside mobile phone is shown as below picture:



The length of the diagonal of the mobile phone is 155mm.

Table 7.2.2 Sides For Hotspot Testing

Mode	Exposure Condition	Front Side	Rear Side	Left Side	Right Side	Top Side	Bottom Side
GSM850/1900	Hotspot	YES	YES	YES	YES	NO	YES
UMTS Band 2/5	Hotspot	YES	YES	YES	YES	NO	YES
LTE Band 2/4/5/7	Hotspot	YES	YES	YES	YES	NO	YES
2.4GWiFi	Hotspot	YES	YES	NO	YES	YES	NO

Note: Per KDB 941225 D06, particular DUT edges were not required to be evaluated for Hotspot SAR if the antenna-to-edge distance is greater than 2.5cm.

8.TEST RESULT

8.1CONDUCTED POWER RESULTS

8.1.1CONDUCTED POWER MEASUREMENTS OF GSM850

GSM850		Tune-up	Max Burst Average Power (dBm)			Tune-up	Max Frame Average Power (dBm)		
			128CH	190CH	251CH		128CH	190CH	251CH
			824.2MHz	836.6MHz	848.8MHz		824.2MHz	836.6MHz	848.8MHz
GSM (CS)		33.00	32.71	32.82	32.85	23.81	23.52	23.63	23.66
GPRS/ EDGE (GMSK)	1 Tx Slot	33.00	32.71	32.82	32.85	23.81	23.52	23.63	23.66
	2 Tx Slots	32.50	31.92	32.01	32.03	26.37	25.79	25.88	25.90
	3 Tx Slots	30.50	30.05	30.18	30.23	26.08	25.63	25.76	25.81
	4 Tx Slots	29.50	28.92	29.05	29.09	26.32	25.74	25.87	25.91
EDGE (8PSK)	1 Tx Slot	27.50	26.71	26.55	26.62	18.31	17.52	17.36	17.43
	2 Tx Slots	26.50	25.74	25.64	25.70	20.37	19.61	19.51	19.57
	3 Tx Slots	24.50	23.92	23.74	23.80	20.08	19.50	19.32	19.38
	4 Tx Slots	23.50	22.80	22.71	22.72	20.32	19.62	19.53	19.54

Note:
1) The conducted power of GSM850 is measured with RMS detector.
2) Frame-averaged output power was calculated from the measured burst-averaged output power by converting the slot powers into linear units and calculating the energy over 8 time slots.
3) Per KDB941225 D01, the bolded GPRS 2Tx mode was selected for SAR testing according to the highest frame –averaged output power table.
4) 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)

8.1.2CONDUCTED POWER MEASUREMENTS OF GSM1900

GSM1900		Tune-up	Max Burst Average Power (dBm)			Tune-up	Max Frame Average Power (dBm)		
			512CH	661CH	810CH		512CH	661CH	810CH
			1850.2MHz	1880MHz	1909.8MHz		1850.2MHz	1880MHz	1909.8MHz
GSM (CS)		30.50	29.25	29.29	29.03	21.31	20.06	20.10	19.84
GPRS /EDGE (GMSK)	1 Tx Slot	30.50	29.25	29.29	29.03	21.31	20.06	20.10	19.84
	2 Tx Slots	29.50	28.27	28.30	28.05	23.37	22.14	22.17	21.92
	3 Tx Slots	27.00	26.29	26.34	26.08	22.58	21.87	21.92	21.66
	4 Tx Slots	26.00	25.22	25.26	24.97	22.82	22.04	22.08	21.79
EDGE (8PSK)	1 Tx Slot	26.00	25.17	25.60	25.00	16.81	15.98	16.41	15.81
	2 Tx Slots	25.00	24.01	24.42	23.92	18.87	17.88	18.29	17.79
	3 Tx Slots	23.00	21.94	22.25	21.71	18.58	17.52	17.83	17.29
	4 Tx Slots	22.00	20.82	21.13	20.80	18.82	17.64	17.95	17.62

Note:
1) The conducted power of GSM1900 is measured with RMS detector.
2) Frame-averaged output power was calculated from the measured burst-averaged output power by converting the slot powers into linear units and calculating the energy over 8 time slots.
3) Per KDB941225 D01, the bolded GPRS 2Tx mode was selected for SAR testing according to the highest frame –averaged output power table.
4) 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)

8.1.3CONDUCTED POWER MEASUREMENTS OF UMTS Band 2

CRO-L03

UMTS Band 2		Tune-up	**SAR Conducted Power (dBm)**		
			9262CH	9400CH	9538CH
			1852.4	1880	1907.6
WCDMA	AMR Voice	23.00	21.97	22.37	22.42
	12.2kbps RMC	23.00	21.98	22.34	22.47
	64kbps RMC	23.00	21.93	22.37	22.47
	144kbps RMC	23.00	21.98	22.37	22.46
	384kbps RMC	23.00	21.99	22.36	22.42
HSDPA	Subtest 1	22.00	20.95	21.30	21.46
	Subtest 2	22.00	20.94	21.32	21.49
	Subtest 3	22.00	20.45	20.80	21.01
	Subtest 4	22.00	20.39	20.77	21.02
HSUPA	Subtest 1	21.00	19.04	19.38	19.51
	Subtest 2	21.00	19.03	19.35	19.47
	Subtest 3	22.00	20.18	20.55	20.56
	Subtest 4	21.00	19.58	19.14	19.07
	Subtest 5	22.00	20.60	20.86	21.00
DC-HSDPA	Subtest 1	22.00	20.95	21.30	21.46
	Subtest 2	22.00	20.94	21.32	21.49
	Subtest 3	22.00	20.45	20.80	21.01
	Subtest 4	22.00	20.39	20.77	21.02
HSPA+	Subtest-1(UL 16QAM)	21.00	20.42	20.73	20.61

Note:
1) The conducted power of UMTS Band 2 is measured with RMS detector.
2) Note: Per KDB941225 D01, When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤¼ 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.

CRO-L23

UMTS Band 2		Tune-up	SAR Conducted Power (dBm)		
			9262CH	9400CH	9538CH
			1852.4	1880	1907.6
WCDMA	AMR Voice	23.00	22.65	22.34	22.35
	12.2kbps RMC	23.00	22.65	22.34	22.35
	64kbps RMC	23.00	22.59	22.41	22.34
	144kbps RMC	23.00	22.60	22.40	22.32
	384kbps RMC	23.00	22.58	22.38	22.33
HSDPA	Subtest 1	22.00	21.59	21.31	21.40
	Subtest 2	22.00	21.57	21.30	21.37
	Subtest 3	22.00	21.03	20.83	20.98
	Subtest 4	22.00	21.01	20.81	20.95
HSUPA	Subtest 1	21.00	19.59	19.44	19.42
	Subtest 2	21.00	19.53	19.39	19.40
	Subtest 3	22.00	20.72	20.67	20.48
	Subtest 4	21.00	19.98	19.27	19.09
	Subtest 5	22.00	21.04	20.83	20.95
DC-HSDPA	Subtest 1	22.00	21.59	21.31	21.40
	Subtest 2	22.00	21.57	21.30	21.37
	Subtest 3	22.00	21.03	20.83	20.98
	Subtest 4	22.00	21.01	20.81	20.95
HSPA+	Subtest-1(UL 16QAM)	21.00	20.78	20.68	20.54

Note:
1) The conducted power of UMTS Band 2 is measured with RMS detector.
2) Note: Per KDB941225 D01, When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤¼ 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.

8.1.4CONDUCTED POWER MEASUREMENTS OF UMTS Band 5

UMTS Band 5		Tune-up	SAR Conducted Power (dBm)		
			4132CH	4182CH	4233CH
			826.4	836.4	846.6
WCDMA	AMR Voice	23.50	22.33	22.49	22.51
	12.2kbps RMC	23.50	22.36	22.52	22.45
	64kbps RMC	23.50	22.36	22.53	22.50
	144kbps RMC	23.50	22.39	22.51	22.52
	384kbps RMC	23.50	22.38	22.51	22.48
HSDPA	Subtest 1	22.00	21.36	21.57	21.47
	Subtest 2	22.00	21.40	21.52	21.53
	Subtest 3	22.00	20.94	21.10	21.06
	Subtest 4	22.00	20.89	21.06	21.05
HSUPA	Subtest 1	21.00	19.36	19.51	19.46
	Subtest 2	21.00	19.34	19.47	19.45
	Subtest 3	22.00	20.52	20.70	20.68
	Subtest 4	21.00	19.94	20.11	20.08
	Subtest 5	22.00	20.83	20.95	20.94
DC-HSDPA	Subtest 1	22.00	21.36	21.57	21.47
	Subtest 2	22.00	21.40	21.52	21.53
	Subtest 3	22.00	20.94	21.10	21.06
	Subtest 4	22.00	20.89	21.06	21.05
HSPA+	Subtest-1(UL 16QAM)	21.00	20.48	20.41	20.42

Note:
1) The conducted power of UMTS Band 5 is measured with RMS detector.
2) Per KDB941225 D01, When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤¼ 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.

8.1.5CONDUCTED POWER MEASUREMENTS OF LTE Band 2

FDD LTE B2					Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					18607	18900	19193
					1850.7	1880	1909.3
1.4MHz	QPSK	1	0	23.00	21.58	22.46	22.07
		1	2	23.00	21.64	22.51	22.13
		1	5	23.00	21.60	22.44	22.09
		3	0	23.00	21.70	22.45	22.08
		3	1	23.00	21.64	22.34	22.02
		3	3	23.00	21.70	22.44	22.09
		6	0	22.00	20.63	21.39	21.07
	16QAM	1	0	22.00	20.59	21.61	20.85
		1	2	22.00	20.65	21.61	20.87
		1	5	22.00	20.61	21.55	20.87
		3	0	22.00	20.61	21.40	21.07
		3	1	22.00	20.54	21.11	21.04
		3	3	22.00	20.60	21.50	21.08
		6	0	21.00	19.63	20.51	20.05
Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					18615	18900	19185
					1851.5	1880	1908.5
3MHz	QPSK	1	0	23.00	21.51	22.41	21.98
		1	7	23.00	21.59	22.44	22.03
		1	14	23.00	21.55	22.39	21.96
		8	0	22.00	20.69	21.49	21.12
		8	3	22.00	20.69	21.48	21.12
		8	7	22.00	20.67	21.47	21.12
		15	0	22.00	20.65	21.42	21.07
	16QAM	1	0	22.00	20.51	21.72	20.92
		1	7	22.00	20.71	21.77	20.87
		1	14	22.00	20.57	21.69	20.77
		8	0	21.00	19.78	20.52	20.00
		8	3	21.00	19.81	20.53	20.00
		8	7	21.00	19.78	20.52	19.97
		15	0	21.00	19.71	20.46	19.90

Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					18625	18900	19175
					1852.5	1880	1907.5
5MHz	QPSK	1	0	23.00	21.74	22.45	22.13
		1	12	23.00	21.76	22.43	22.10
		1	24	23.00	21.72	22.41	22.07
		12	0	22.00	20.69	21.50	21.12
		12	6	22.00	20.71	21.46	21.13
		12	13	22.00	20.71	21.47	21.11
		25	0	22.00	20.63	21.43	21.07
	16QAM	1	0	22.00	20.84	21.97	21.21
		1	12	22.00	20.89	21.91	21.03
		1	24	22.00	20.84	21.91	20.94
		12	0	21.00	19.80	20.63	20.00
		12	6	21.00	19.80	20.60	20.04
		12	13	21.00	19.82	20.61	19.95
		25	0	21.00	19.69	20.48	19.87
Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					18650	18900	19150
					1855	1880	1905
10MHz	QPSK	1	0	23.00	21.68	22.51	22.07
		1	24	23.00	21.70	22.49	22.05
		1	49	23.00	21.70	22.51	22.05
		25	0	22.00	20.70	21.45	21.09
		25	12	22.00	20.69	21.42	21.07
		25	25	22.00	20.71	21.43	21.08
		50	0	22.00	20.72	21.44	21.07
	16QAM	1	0	22.00	20.63	21.82	21.07
		1	24	22.00	20.64	21.76	21.00
		1	49	22.00	20.62	21.83	20.81
		25	0	21.00	19.72	20.48	19.86
		25	12	21.00	19.71	20.45	20.29
		25	25	21.00	19.74	20.45	20.25
		50	0	21.00	19.72	20.46	20.00

Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					18675	18900	19125
					1857.5	1880	1902.5
15MHz	QPSK	1	0	23.00	21.82	22.47	22.61
		1	38	23.00	21.82	22.44	22.53
		1	74	23.00	21.82	22.47	22.69
		36	0	22.00	20.86	21.77	21.67
		36	18	22.00	20.89	21.49	21.73
		36	39	22.00	20.89	21.51	21.74
		75	0	22.00	20.91	21.54	21.55
	16QAM	1	0	22.00	20.74	21.81	21.66
		1	38	22.00	20.77	21.71	21.41
		1	74	22.00	20.78	21.65	21.48
		36	0	21.00	19.86	20.85	20.35
		36	18	21.00	19.88	20.48	20.37
		36	39	21.00	19.88	20.47	20.32
		75	0	21.00	19.90	20.49	20.38
Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					18700	18900	19100
					1860	1880	1900
20MHz	QPSK	1	0	23.00	22.03	22.65	22.70
		1	50	23.00	21.97	21.89	22.60
		1	99	23.00	21.98	22.64	22.51
		50	0	22.00	20.96	21.57	21.38
		50	25	22.00	20.96	21.53	21.29
		50	50	22.00	20.99	21.56	21.39
		100	0	22.00	20.95	21.53	21.47
	16QAM	1	0	22.00	21.46	21.97	21.93
		1	50	22.00	21.49	20.05	21.75
		1	99	22.00	21.13	21.75	21.66
		50	0	21.00	20.01	20.57	20.45
		50	25	21.00	20.02	20.53	20.42
		50	50	21.00	20.05	20.56	20.45
		100	0	21.00	20.00	20.51	20.46

8.1.6CONDUCTED POWER MEASUREMENTS OF LTE Band 4

FDD LTE B4					Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Tune-up	Low 19957 1710.7	Mid 20175 1732.5	High 20393 1754.3
1.4MHz	QPSK	1	0	22.50	22.36	21.73	20.91
		1	2	22.50	22.42	21.73	20.99
		1	5	22.50	22.09	21.69	20.92
		3	0	22.50	22.27	21.75	21.03
		3	1	22.50	22.18	21.66	20.97
		3	3	22.50	22.31	21.73	21.04
		6	0	22.00	21.22	20.64	20.02
	16QAM	1	0	22.00	21.60	21.05	20.09
		1	2	22.00	21.74	21.00	20.04
		1	5	22.00	21.27	20.99	20.02
		3	0	22.00	21.34	20.92	20.22
		3	1	22.00	21.26	20.79	20.18
		3	3	22.00	21.34	20.83	20.20
		6	0	21.00	20.18	19.54	19.16
Bandwidth	Modulation	RB size	RB offset	Tune-up	Low 19965 1711.5	Mid 20175 1732.5	High 20385 1753.5
3MHz	QPSK	1	0	22.50	22.27	21.69	21.01
		1	7	22.50	22.30	21.68	21.03
		1	14	22.50	22.42	21.68	20.96
		8	0	22.00	21.48	20.72	20.07
		8	3	22.00	21.28	20.70	20.09
		8	7	22.00	21.37	20.70	20.07
		15	0	22.00	20.95	20.66	20.06
	16QAM	1	0	22.00	21.17	20.98	20.07
		1	7	22.00	21.21	20.98	20.09
		1	14	22.00	21.24	20.97	20.02
		8	0	21.00	20.51	19.81	19.14
		8	3	21.00	20.51	19.78	19.15
		8	7	21.00	20.46	19.77	19.13
		15	0	21.00	20.40	19.72	19.14

Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					19975	20175	20375
					1712.5	1732.5	1752.5
5MHz	QPSK	1	0	22.50	22.42	21.79	21.17
		1	12	22.50	22.42	21.70	21.13
		1	24	22.50	22.01	21.70	21.08
		12	0	22.00	21.26	20.74	20.06
		12	6	22.00	21.27	20.69	20.04
		12	13	22.00	21.25	20.70	20.04
		25	0	22.00	21.23	20.65	20.08
	16QAM	1	0	22.00	21.50	21.25	20.17
		1	12	22.00	21.49	21.16	20.14
		1	24	22.00	21.22	21.15	20.09
		12	0	21.00	20.57	19.90	19.11
		12	6	21.00	20.54	19.87	19.12
		12	13	21.00	20.79	19.86	19.07
		25	0	21.00	20.46	19.74	19.05
Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					20000	20175	20350
					1715	1732.5	1750
10MHz	QPSK	1	0	22.50	22.36	21.84	21.06
		1	24	22.50	22.15	21.65	21.03
		1	49	22.50	22.13	21.76	21.28
		25	0	22.00	21.24	20.74	20.03
		25	12	22.00	21.18	20.68	20.04
		25	25	22.00	21.16	20.71	20.03
		50	0	22.00	21.21	20.73	20.05
	16QAM	1	0	22.00	21.25	21.17	20.10
		1	24	22.00	21.30	21.00	20.05
		1	49	22.00	20.91	21.07	20.02
		25	0	21.00	20.45	19.79	19.16
		25	12	21.00	20.30	19.72	19.12
		25	25	21.00	20.26	19.76	19.13
		50	0	21.00	20.33	19.75	19.10

Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					20025	20175	20325
					1717.5	1732.5	1747.5
15MHz	QPSK	1	0	22.50	22.19	21.86	21.16
		1	37	22.50	22.16	21.52	21.12
		1	74	22.50	22.07	21.70	21.02
		36	0	22.00	21.23	21.70	20.11
		36	19	22.00	21.19	20.93	20.10
		36	39	22.00	21.17	20.78	20.07
		75	0	22.00	21.22	20.81	20.10
	16QAM	1	0	22.00	21.30	21.20	20.54
		1	37	22.00	21.01	20.99	20.49
		1	74	22.00	21.16	21.09	20.46
		36	0	21.00	20.33	20.99	19.09
		36	19	21.00	20.30	19.78	19.07
		36	39	21.00	20.27	19.80	19.06
		75	0	21.00	20.33	19.80	19.11

Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					20050	20175	20300
					1720	1732.5	1745
20MHz	QPSK	1	0	22.50	22.44	22.06	21.47
		1	50	22.50	22.19	21.13	21.45
		1	99	22.50	22.12	21.70	21.21
		50	0	22.00	21.25	20.79	20.46
		50	25	22.00	21.16	20.81	20.52
		50	50	22.00	21.13	20.98	20.62
		100	0	22.00	21.15	20.94	20.44
	16QAM	1	0	22.00	21.99	21.61	20.79
		1	50	22.00	21.70	20.24	20.70
		1	99	22.00	21.51	21.22	20.69
		50	0	21.00	20.30	19.90	19.37
		50	25	21.00	20.22	19.79	19.30
		50	50	21.00	20.19	19.84	19.33
		100	0	21.00	20.21	19.83	19.36

8.1.7CONDUCTED POWER MEASUREMENTS OF LTE Band 5

FDD LTE B5					Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					20407	20525	20643
					824.7	836.5	848.3
1.4MHz	QPSK	1	0	23.00	22.53	22.11	21.86
		1	2	23.00	22.60	22.16	21.94
		1	5	23.00	22.53	22.09	21.90
		3	0	23.00	22.54	22.13	21.95
		3	1	23.00	22.47	22.07	21.89
		3	3	23.00	22.55	22.10	21.97
		6	0	22.00	21.50	21.08	20.91
	16QAM	1	0	22.00	21.54	21.46	20.91
		1	2	22.00	21.64	21.49	20.96
		1	5	22.00	21.56	21.43	20.94
		3	0	22.00	21.57	21.34	21.12
		3	1	22.00	21.50	21.23	21.07
		3	3	22.00	21.56	21.29	21.12
		6	0	21.00	20.63	20.01	20.10
Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					20415	20525	20635
					825.5	836.5	847.5
3MHz	QPSK	1	0	23.00	22.46	22.11	21.86
		1	7	23.00	22.50	22.10	21.87
		1	14	23.00	22.44	22.06	21.86
		8	0	22.00	21.59	21.17	20.96
		8	3	22.00	21.60	21.12	20.97
		8	7	22.00	21.57	21.12	20.95
		15	0	22.00	21.54	21.11	20.94
	16QAM	1	0	22.00	21.37	21.44	20.91
		1	7	22.00	21.40	21.45	20.91
		1	14	22.00	21.32	21.40	20.85
		8	0	21.00	20.69	20.24	20.00
		8	3	21.00	20.70	20.26	19.99
		8	7	21.00	20.68	20.21	19.97
		15	0	21.00	20.58	20.20	19.90

Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					20425	20525	20625
					826.5	836.5	846.5
5MHz	QPSK	1	0	23.00	22.66	22.19	21.93
		1	12	23.00	22.62	22.11	21.96
		1	24	23.00	22.51	22.08	21.91
		12	0	22.00	21.58	21.20	20.91
		12	6	22.00	21.56	21.15	20.91
		12	13	22.00	21.54	21.12	20.90
		25	0	22.00	21.51	21.12	20.85
	16QAM	1	0	22.00	21.71	21.67	20.99
		1	12	22.00	21.67	21.62	21.00
		1	24	22.00	21.58	21.57	20.95
		12	0	21.00	20.69	20.36	19.97
		12	6	21.00	20.66	20.31	19.96
		12	13	21.00	20.64	20.28	19.95
		25	0	21.00	20.56	20.19	19.81
Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					20450	20525	20600
					829	836.5	844
10MHz	QPSK	1	0	23.00	22.53	22.24	21.90
		1	24	23.00	22.45	22.17	21.89
		1	49	23.00	22.34	22.18	21.88
		25	0	22.00	21.47	21.15	20.92
		25	12	22.00	21.42	21.13	20.89
		25	25	22.00	21.39	21.11	20.90
		50	0	22.00	21.47	21.18	20.91
	16QAM	1	0	22.00	21.45	21.53	20.94
		1	24	22.00	21.35	21.48	20.93
		1	49	22.00	21.25	21.51	20.88
		25	0	21.00	20.54	20.23	20.04
		25	12	21.00	20.47	20.20	19.99
		25	25	21.00	20.45	20.18	20.01
		50	0	21.00	20.48	20.21	19.97

8.1.8CONDUCTED POWER MEASUREMENTS OF LTE BAND 7

1）Conducted power measurement results of LTE Band 7 (Hotspot disabled)

FDD LTE B7					Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					20775	21100	21425
					2502.5	2535	2567.5
5MHz	QPSK	1	0	22.50	22.01	21.85	22.46
		1	12	22.50	22.04	21.82	22.46
		1	24	22.50	21.76	21.80	22.41
		12	0	21.50	20.57	20.81	21.33
		12	6	21.50	20.69	20.79	21.32
		12	13	21.50	20.73	20.79	21.34
		25	0	21.50	20.72	20.74	21.29
	16QAM	1	0	21.50	20.99	21.39	21.21
		1	12	21.50	21.01	21.45	21.33
		1	24	21.50	20.99	21.47	21.30
		12	0	21.00	19.97	20.06	20.37
		12	6	21.00	19.99	20.43	20.38
		12	13	21.00	20.01	20.22	20.37
		25	0	21.00	19.89	20.05	20.23
Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					20800	21100	21400
					2505	2535	2565
10MHz	QPSK	1	0	22.50	21.84	22.04	22.45
		1	24	22.50	21.92	22.00	22.41
		1	49	22.50	22.00	22.02	22.39
		25	0	21.50	20.86	20.90	21.27
		25	12	21.50	20.86	20.86	21.27
		25	25	21.50	20.87	20.89	21.26
		50	0	21.50	20.88	20.88	21.29
	16QAM	1	0	21.50	20.67	21.25	21.21
		1	24	21.50	20.74	21.18	21.23
		1	49	21.50	20.76	21.21	21.22
		25	0	21.00	19.87	19.91	20.32
		25	12	21.00	19.87	19.83	20.34
		25	25	21.00	19.90	19.90	20.36
		50	0	21.00	19.87	19.88	20.31

Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					20825	21100	21375
					2507.5	2535	2562.5
15MHz	QPSK	1	0	22.50	21.72	22.13	22.45
		1	38	22.50	21.80	22.02	22.43
		1	74	22.50	21.93	22.11	22.47
		36	0	21.50	20.79	20.98	21.42
		36	18	21.50	20.82	20.95	21.37
		36	39	21.50	20.91	21.00	21.35
		75	0	21.50	20.86	21.00	21.39
	16QAM	1	0	21.50	20.56	21.34	21.45
		1	38	21.50	20.62	21.24	21.42
		1	74	21.50	20.70	21.31	21.46
		36	0	21.00	19.73	20.00	20.29
		36	18	21.00	19.74	19.97	20.23
		36	39	21.00	19.84	20.00	20.25
		75	0	21.00	19.78	19.98	20.28
Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					20850	21100	21350
					2510	2535	2560
20MHz	QPSK	1	0	22.50	21.95	22.17	22.45
		1	50	22.50	21.83	21.99	22.42
		1	99	22.50	21.92	22.15	22.43
		50	0	21.50	20.75	20.99	21.28
		50	25	21.50	20.78	20.94	21.25
		50	50	21.50	20.88	20.99	21.26
		100	0	21.50	20.78	20.95	21.24
	16QAM	1	0	21.50	21.20	21.40	21.46
		1	50	21.50	21.26	21.31	21.49
		1	99	21.50	21.39	21.37	21.46
		50	0	21.00	19.78	19.98	20.21
		50	25	21.00	19.81	19.93	20.16
		50	50	21.00	19.89	19.98	20.22
		100	0	21.00	19.81	19.94	20.21

2) Conducted power measurement results of LTE Band 7 (Hotspot activated)

FDD LTE B7					Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					20775	21100	21425
					2502.5	2535	2567.5
5MHz	QPSK	1	0	21.50	20.92	21.18	21.20
		1	12	21.50	20.94	21.20	21.16
		1	24	21.50	20.93	21.18	21.18
		12	0	21.50	20.88	21.10	21.21
		12	6	21.50	20.90	21.13	21.25
		12	13	21.50	20.91	21.10	21.25
		25	0	21.50	20.84	21.07	21.14
	16QAM	1	0	21.50	20.82	21.32	20.89
		1	12	21.50	20.88	21.29	21.03
		1	24	21.50	20.84	21.36	21.01
		12	0	21.50	19.76	20.07	20.07
		12	6	21.50	19.82	20.09	20.07
		12	13	21.50	19.62	20.06	20.04
		25	0	21.50	19.60	19.84	19.91
Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					20800	21100	21400
					2505	2535	2565
10MHz	QPSK	1	0	21.50	20.85	21.14	21.20
		1	24	21.50	20.91	21.18	21.25
		1	49	21.50	20.92	21.16	20.98
		25	0	21.50	20.83	21.07	20.83
		25	12	21.50	20.86	21.09	20.76
		25	25	21.50	20.89	21.12	20.87
		50	0	21.50	20.85	21.10	20.80
	16QAM	1	0	21.50	20.75	21.13	20.83
		1	24	21.50	20.64	21.15	20.93
		1	49	21.50	20.60	21.25	20.92
		25	0	21.50	19.67	19.95	20.00
		25	12	21.50	19.54	19.94	20.03
		25	25	21.50	19.68	19.90	20.07
		50	0	21.50	20.09	20.01	19.97

Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					20825	21100	21375
					2507.5	2535	2562.5
15MHz	QPSK	1	0	21.50	20.85	21.29	21.17
		1	38	21.50	20.87	20.62	21.09
		1	74	21.50	21.21	20.99	21.05
		36	0	21.50	21.19	20.80	21.16
		36	18	21.50	21.26	20.61	21.13
		36	39	21.50	21.15	20.77	21.10
		75	0	21.50	21.25	20.78	21.15
	16QAM	1	0	21.50	20.63	21.19	21.28
		1	38	21.50	20.64	21.11	21.22
		1	74	21.50	20.67	21.33	21.33
		36	0	21.50	19.78	20.01	20.02
		36	18	21.50	19.78	20.02	20.01
		36	39	21.50	19.70	20.05	20.01
		75	0	21.50	19.77	20.05	20.06
Bandwidth	Modulation	RB size	RB offset	Tune-up	Low	Mid	High
					20850	21100	21350
					2510	2535	2560
20MHz	QPSK	1	0	21.50	20.81	20.89	21.11
		1	50	21.50	20.83	20.99	21.09
		1	99	21.50	20.90	21.04	21.03
		50	0	21.50	20.62	20.91	21.01
		50	25	21.50	20.63	20.96	20.96
		50	50	21.50	20.77	21.01	20.99
		100	0	21.50	20.61	20.95	20.99
	16QAM	1	0	21.50	21.22	21.30	21.32
		1	50	21.50	21.25	21.36	21.26
		1	99	21.50	21.32	21.39	21.36
		50	0	21.50	19.77	19.98	19.98
		50	25	21.50	19.76	20.01	19.91
		50	50	21.50	19.76	20.03	19.97
		100	0	21.50	19.73	19.97	19.97

8.1.9CONDUCTED POWER MEASUREMENTS OF WiFi 2.4G

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Power Setting	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11b	1	2412	1	17.00	17.00	16.23	No
	6	2437		17.00	17.00	16.12	No
	11	2462		17.00	17.00	16.41	Yes
802.11g	1	2412	6	Not Required	16.00	Not Required	No
	6	2437		Not Required	16.00	Not Required	No
	11	2462		Not Required	16.00	Not Required	No
802.11n HT20	1	2412	6.5	Not Required	15.00	Not Required	No
	6	2437		Not Required	15.00	Not Required	No
	11	2462		Not Required	15.00	Not Required	No
802.11n HT40	3	2422	13.5	Not Required	15.00	Not Required	No
	6	2437		Not Required	15.00	Not Required	No
	9	2452		Not Required	15.00	Not Required	No

Note:

1) The Average conducted power of WiFi is measured with RMS detector.

2) Per KDB248227 D01, for WiFi 2.4GHz, the highest measured maximum output power Channel for DSSS modes (802.11b) was selected for SAR measurement.SAR for OFDM modes (2.4GHz 802.11g/n) was not required When the highest reported SAR for DSSS is adjusted by the ratio of OFDM modes (802.11g/n) to DSSS modes (802.11b) specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

8.1.10CONDUCTED POWER MEASUREMENTS OF BT

BT	Tune Up	Average Conducted Power (dBm)		
		CH0	CH39	CH78
DH5	9.00	6.51	7.52	7.19
2DH5	7.00	5.86	6.93	6.54
3DH5	7.00	5.88	6.95	6.46

BT	Tune Up	Average Conducted Power (dBm)		
		CH0	CH19	CH39
BLE	1.00	-0.96	0.48	-0.31

Note:
1) The conducted power of BT is measured with RMS detector.

8.2SAR TEST RESULTS

General Notes:

1) Per KDB447498 D01, all measurement SAR results are scaled to the maximum tune-up tolerance limit to demonstrate compliant.
2) Per KDB447498 D01, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:≤0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is≤100 MHz. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.
3) Per KDB865664 D01,for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg; if the deviation among the repeated measurement is ≤ 20%,and the measured SAR <1.45W/kg, only one repeated measurement is required.
4) Per KDB941225 D06, the DUT Dimension is bigger than 9 cm x 5 cm, so 10mm is chosen as the test separation distance for Hotspot mode. When the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested.
5) Per KDB648474 D04, SAR is evaluated without a headset connected to the device. When the standalone reported body-worn SAR is ≤1.2 W/kg, no additional SAR evaluations using a headset are required.
6) Per KDB865664 D02, SAR plot is only required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination; Plots are also required when the measured SAR is > 1.5 W/kg, or > 7.0 W/kg for occupational exposure. The published RF exposure KDB procedures may require additional plots; for example, to support SAR to peak location separation ratio test exclusion and/or volume scan post-processing.

GSM Notes:

1) Per KDB648474 D04, body-worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.
2) Per KDB941225 D01, SAR test reduction for GPRS and EDGE 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.

UMTS Notes:

Per KDB941225 D01, When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤¼ 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.

LTE notes:

1) The LTE test configurations are determined according to KDB941225 D05 SAR for LTE Devices. The general test procedures used for SAR testing can be found in Section 7.1.3.
2) A-MPR was disabled for all SAR test by setting NS_01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames(maximum TTI)

WLAN Notes:

1. For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2. Justification for test configurations for WLAN per KDB Publication 248227 for 2.4GHZ WIFI single transmission chain operations, the highest measured maximum output power Channel for DSSS was selected for SAR measurement.SAR for OFDM modes(2.4GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 7.1.4 for more information.

8.2.1SAR MEASUREMENT RESULT OF HEAD

1. Head SAR test results of GSM&UMTS

Test No.	Band	Mode	CH	Test Position	SIM	Battery	Tune up	Measured	Drift (dB)	SAR Value (W/kg)1-g	Reported SAR	Test Sample
T01	GSM 850	GSM	190	Right Cheek	1	1	33	32.82	0.03	0.372	0.388	CRO-L03
T02	GSM 850	GSM	190	Right Tilted	1	1	33	32.82	0.06	0.275	0.287	
T03	GSM 850	GSM	190	Left Cheek	1	1	33	32.82	0.02	**0.409**	0.426	
T04	GSM 850	GSM	190	Left Tilted	1	1	33	32.82	-0.02	0.238	0.248	
T05	GSM 850	GSM	190	Left Cheek	1	2	33	32.82	-0.01	0.372	0.388	
T06	GSM 850	GSM	190	Left Cheek	1	1	33	32.82	0.03	0.276	0.288	CRO-L23
T07	GSM 850	GSM	190	Left Cheek	2	1	33	32.82	-0.01	0.278	0.290	
T20	GSM 1900	GSM	661	Right Cheek	1	1	30.5	29.29	0.00	0.182	0.240	CRO-L03
T21	GSM 1900	GSM	661	Right Tilted	1	1	30.5	29.29	0.03	0.136	0.180	
T22	GSM 1900	GSM	661	Left Cheek	1	1	30.5	29.29	0.02	0.228	0.301	
T23	GSM 1900	GSM	661	Left Tilted	1	1	30.5	29.29	-0.04	0.127	0.168	
T24	GSM 1900	GSM	661	Left Cheek	1	2	30.5	29.29	0.06	**0.293**	0.387	
T25	GSM 1900	GSM	661	Left Cheek	1	2	30.5	29.29	0.04	0.090	0.119	CRO-L23
T26	GSM 1900	GSM	661	Left Cheek	2	2	30.5	29.29	-0.04	0.095	0.126	
T40	UMTS B2	RMC12.2K	9400	Right Cheek	1	1	23	22.34	-0.03	0.232	0.270	CRO-L03
T41	UMTS B2	RMC12.2K	9400	Right Tilted	1	1	23	22.34	0.02	0.167	0.194	
T42	UMTS B2	RMC12.2K	9400	Left Cheek	1	1	23	22.34	0.01	0.271	0.315	
T43	UMTS B2	RMC12.2K	9400	Left Tilted	1	1	23	22.34	0.00	0.134	0.156	
T44	UMTS B2	RMC12.2K	9400	Left Cheek	1	2	23	22.34	0.01	**0.332**	0.386	
T45	UMTS B2	RMC12.2K	9400	Left Cheek	1	2	23	22.34	-0.03	0.178	0.207	CRO-L23
T46	UMTS B2	RMC12.2K	9400	Left Cheek	2	2	23	22.34	0.05	0.161	0.187	
T60	UMTS B5	RMC12.2K	4182	Right Cheek	1	1	23.5	22.52	0.07	0.266	0.333	CRO-L03
T61	UMTS B5	RMC12.2K	4182	Right Tilted	1	1	23.5	22.52	0.08	0.168	0.211	
T62	UMTS B5	RMC12.2K	4182	Left Cheek	1	1	23.5	22.52	0.07	0.272	0.341	
T63	UMTS B5	RMC12.2K	4182	Left Tilted	1	1	23.5	22.52	0.06	0.170	0.213	
T64	UMTS B5	RMC12.2K	4182	Left Cheek	1	2	23.5	22.52	-0.08	**0.274**	0.343	
T65	UMTS B5	RMC12.2K	4182	Left Cheek	1	2	23.5	22.52	-0.05	0.237	0.297	CRO-L23
T66	UMTS B5	RMC12.2K	4182	Left Cheek	2	2	23.5	22.52	0.01	0.264	0.331	

2. Head SAR test results of LTE

Test No.	Band	Mode	CH	RB	Offset	Test Position	SIM	Battery	Tune up	Measured	Drift(dB)	SAR Value (W/kg)1-g	Reported SAR	Test Sample
T80	LTE B2	QPSK20M	19100	1	0	Right Cheek	1	1	23	22.7	0.02	0.310	0.332	
T81	LTE B2	QPSK20M	19100	1	0	Right Tilted	1	1	23	22.7	0.03	0.194	0.208	
T82	LTE B2	QPSK20M	19100	1	0	Left Cheek	1	1	23	22.7	0.06	0.291	0.312	
T83	LTE B2	QPSK20M	19100	1	0	Left Tilted	1	1	23	22.7	-0.05	0.168	0.180	
T84	LTE B2	QPSK20M	18900	50	0	Right Cheek	1	1	22	21.57	-0.07	0.203	0.224	CRO-L03
T85	LTE B2	QPSK20M	18900	50	0	Right Tilted	1	1	22	21.57	-0.03	0.173	0.191	
T86	LTE B2	QPSK20M	18900	50	0	Left Cheek	1	1	22	21.57	0.02	0.224	0.247	
T87	LTE B2	QPSK20M	18900	50	0	Left Tilted	1	1	22	21.57	0.00	0.127	0.140	
T88	LTE B2	QPSK20M	19100	1	0	Right Cheek	1	2	23	22.7	0.07	**0.327**	0.350	
T89	LTE B2	QPSK20M	19100	1	0	Right Cheek	1	2	23	22.7	0.05	0.229	0.245	CRO-L23
T90	LTE B2	QPSK20M	19100	1	0	Right Cheek	2	2	23	22.7	-0.06	0.238	0.255	
T100	LTE B4	QPSK20M	20050	1	0	Right Cheek	1	1	22.5	22.44	-0.07	**0.269**	0.273	
T101	LTE B4	QPSK20M	20050	1	0	Right Tilted	1	1	22.5	22.44	-0.06	0.185	0.188	
T102	LTE B4	QPSK20M	20050	1	0	Left Cheek	1	1	22.5	22.44	0.06	0.254	0.258	
T103	LTE B4	QPSK20M	20050	1	0	Left Tilted	1	1	22.5	22.44	0.02	0.159	0.161	
T104	LTE B4	QPSK20M	20050	50	0	Right Cheek	1	1	22	21.25	-0.02	0.195	0.232	CRO-L03
T105	LTE B4	QPSK20M	20050	50	0	Right Tilted	1	1	22	21.25	0.01	0.151	0.179	
T106	LTE B4	QPSK20M	20050	50	0	Left Cheek	1	1	22	21.25	0.00	0.201	0.239	
T107	LTE B4	QPSK20M	20050	50	0	Left Tilted	1	1	22	21.25	0.03	0.117	0.139	
T108	LTE B4	QPSK20M	20050	1	0	Right Cheek	1	2	22.5	22.44	0.06	0.231	0.234	
T109	LTE B4	QPSK20M	20050	1	0	Right Cheek	1	1	22.5	22.44	0.02	0.156	0.158	CRO-L23
T110	LTE B4	QPSK20M	20050	1	0	Right Cheek	2	1	22.5	22.44	0.01	0.164	0.166	
T120	LTE B5	QPSK10M	20450	1	0	Right Cheek	1	1	23	22.53	0.08	0.199	0.222	
T121	LTE B5	QPSK10M	20450	1	0	Right Tilted	1	1	23	22.53	-0.09	0.140	0.156	
T122	LTE B5	QPSK10M	20450	1	0	Left Cheek	1	1	23	22.53	0.06	0.215	0.240	
T123	LTE B5	QPSK10M	20450	1	0	Left Tilted	1	1	23	22.53	0.05	0.144	0.160	
T124	LTE B5	QPSK10M	20450	25	0	Right Cheek	1	1	22	21.47	0.08	0.158	0.179	CRO-L03
T125	LTE B5	QPSK10M	20450	25	0	Right Tilted	1	1	22	21.47	-0.06	0.120	0.136	
T126	LTE B5	QPSK10M	20450	25	0	Left Cheek	1	1	22	21.47	0.03	0.168	0.190	
T127	LTE B5	QPSK10M	20450	25	0	Left Tilted	1	1	22	21.47	0.01	0.113	0.128	
T128	LTE B5	QPSK10M	20450	1	0	Left Cheek	1	2	23	22.53	-0.08	**0.264**	0.294	
T129	LTE B5	QPSK10M	20450	1	0	Left Cheek	1	2	23	22.53	-0.02	0.251	0.280	CRO-L23
T130	LTE B5	QPSK10M	20450	1	0	Left Cheek	2	2	23	22.53	0.06	0.236	0.263	
T140	LTE B7	QPSK20M	21350	1	0	Right Cheek	1	1	22.5	22.45	0.03	0.399	0.404	
T141	LTE B7	QPSK20M	21350	1	0	Right Tilted	1	1	22.5	22.45	-0.02	0.151	0.153	
T142	LTE B7	QPSK20M	21350	1	0	Left Cheek	1	1	22.5	22.45	-0.03	**0.584**	0.591	
T143	LTE B7	QPSK20M	21350	1	0	Left Tilted	1	1	22.5	22.45	0.02	0.240	0.243	
T144	LTE B7	QPSK20M	21350	50	0	Right Cheek	1	1	21.5	21.28	0.01	0.301	0.317	CRO-L03
T145	LTE B7	QPSK20M	21350	50	0	Right Tilted	1	1	21.5	21.28	-0.03	0.119	0.125	
T146	LTE B7	QPSK20M	21350	50	0	Left Cheek	1	1	21.5	21.28	0.05	0.416	0.438	
T147	LTE B7	QPSK20M	21350	50	0	Left Tilted	1	1	21.5	21.28	0.06	0.166	0.175	
T148	LTE B7	QPSK20M	21350	1	0	Left Cheek	1	2	22.5	22.45	-0.03	0.559	0.565	

T149	LTE B7	QPSK20M	21350	1	0	Left Cheek	1	1	22.5	22.45	0.04	0.431	0.436	CRO-L23
T150	LTE B7	QPSK20M	21350	1	0	Left Cheek	2	1	22.5	22.45	0.03	0.411	0.416	

3. Head SAR test results of WIFI

Test No.	Band	CH	Test Position	Battery	Data Rate	Power Setting	Tune up	Measured	Drift(dB)	SAR Value (W/kg)1-g	Reported SAR	Test Sample
T390	802.11b	11	Right Cheek	1	1	17	17	16.41	0.03	0.338	0.387	CRO-L03
T391	802.11b	11	Right Tilted	1	1	17	17	16.41	0.02	0.315	0.361	
T392	802.11b	11	Left Cheek	1	1	17	17	16.41	0.03	0.643	0.737	
T393	802.11b	11	Left Tilted	1	1	17	17	16.41	0.05	0.627	0.718	
T394	802.11b	11	Left Cheek	2	1	17	17	16.41	-0.01	0.626	0.717	
T395	802.11b	11	Left Cheek	1	1	17	17	16.41	-0.06	**0.700**	0.802	CRO-L23

8.2.2SAR MEASUREMENT RESULT OF BODY-WORN

1. Body-worn SAR test results of GSM&UMTS

Test No.	Band	Mode	CH	Test Position (with 15mm)	SIM	Battery	Tune up	Measured	Drift(dB)	SAR Value (W/kg)1-g	Reported SAR	Test Sample
T160	GSM 850	GSM	190	Front Face	1	1	33	32.82	0.02	0.446	0.465	CRO-L03
T161	GSM 850	GSM	190	Rear Face	1	1	33	32.82	-0.07	**0.564**	0.588	
T162	GSM 850	GSM	190	Rear Face	1	2	33	32.82	0.06	0.514	0.536	
T163	GSM 850	GSM	190	Rear Face	1	1	33	32.82	0.02	0.436	0.454	CRO-L23
T164	GSM 850	GSM	190	Rear Face	2	1	33	32.82	0.06	0.415	0.433	
T190	GSM 1900	GSM	661	Front Face	1	1	30.5	29.29	0.01	0.147	0.194	CRO-L03
T191	GSM 1900	GSM	661	Rear Face	1	1	30.5	29.29	-0.02	0.208	0.275	
T192	GSM 1900	GSM	661	Rear Face	1	2	30.5	29.29	0.02	**0.223**	0.295	
T193	GSM 1900	GSM	661	Rear Face	1	2	30.5	29.29	0.02	0.183	0.242	CRO-L23
T194	GSM 1900	GSM	661	Rear Face	2	2	30.5	29.29	0.01	0.189	0.250	
T210	UMTS B2	RMC12.2K	9400	Front Face	1	1	23	22.34	0.04	0.281	0.327	CRO-L03
T211	UMTS B2	RMC12.2K	9400	Rear Face	1	1	23	22.34	0.03	0.377	0.439	
T212	UMTS B2	RMC12.2K	9400	Rear Face	1	2	23	22.34	0.05	0.366	0.426	
T213	UMTS B2	RMC12.2K	9400	Rear Face	1	1	23	22.34	0.03	0.375	0.437	CRO-L23
T214	UMTS B2	RMC12.2K	9400	Rear Face	2	1	23	22.34	-0.09	**0.595**	0.693	
T230	UMTS B5	RMC12.2K	4182	Front Face	1	1	23.5	22.52	-0.01	0.050	0.063	CRO-L03
T231	UMTS B5	RMC12.2K	4182	Rear Face	1	1	23.5	22.52	0.00	0.078	0.098	
T232	UMTS B5	RMC12.2K	4182	Rear Face	1	2	23.5	22.52	0.01	**0.101**	0.127	
T233	UMTS B5	RMC12.2K	4182	Rear Face	1	2	23.5	22.52	0.02	0.081	0.102	CRO-L23
T234	UMTS B5	RMC12.2K	4182	Rear Face	2	2	23.5	22.52	0.01	0.093	0.117	

2. Body-worn SAR test results of LTE

Test No.	Band	Mode	CH	RB	Offset	Test Position (with 15mm)	SIM	Battery	Tune up	Measured	Drift(dB)	SAR Value (W/kg)1-g	Reported SAR	Test Sample
T251	LTE B2	QPSK20M	19100	1	0	Front Face	1	1	23	22.7	0.07	0.249	0.267	CRO-L03
T252	LTE B2	QPSK20M	19100	1	0	Rear Face	1	1	23	22.7	-0.08	0.343	0.368	
T253	LTE B2	QPSK20M	18900	50	0	Front Face	1	1	22	21.57	0.06	0.209	0.231	
T254	LTE B2	QPSK20M	18900	50	0	Rear Face	1	1	22	21.57	-0.08	0.278	0.307	
T255	LTE B2	QPSK20M	19100	1	0	Rear Face	1	2	23	22.7	0.03	0.336	0.360	
T256	LTE B2	QPSK20M	19100	1	0	Rear Face	1	1	23	22.7	0.01	**0.331**	0.355	CRO-L23
T411	LTE B2	QPSK20M	19100	1	0	Rear Face	2	1	23	22.7	0.02	0.292	0.313	
T280	LTE B4	QPSK20M	20050	1	0	Front Face	1	1	22.5	22.44	0.05	0.314	0.318	CRO-L03
T281	LTE B4	QPSK20M	20050	1	0	Rear Face	1	1	22.5	22.44	0.03	0.586	0.594	
T282	LTE B4	QPSK20M	20050	50	0	Front Face	1	1	22	21.25	0.02	0.265	0.315	
T283	LTE B4	QPSK20M	20050	50	0	Rear Face	1	1	22	21.25	-0.03	0.431	0.512	
T284	LTE B4	QPSK20M	20050	1	0	Rear Face	1	2	22.5	22.44	0.04	**0.696**	0.706	
T285	LTE B4	QPSK20M	20050	1	0	Rear Face	1	2	22.5	22.44	0.05	0.480	0.487	CRO-L23
T286	LTE B4	QPSK20M	20050	1	0	Rear Face	2	2	22.5	22.44	0.03	0.501	0.508	
T320	LTE B5	QPSK10M	20450	1	0	Front Face	1	1	23	22.53	0.02	0.216	0.241	CRO-L03
T321	LTE B5	QPSK10M	20450	1	0	Rear Face	1	1	23	22.53	0.01	0.286	0.319	
T322	LTE B5	QPSK10M	20450	25	0	Front Face	1	1	22	21.47	-0.03	0.169	0.191	
T323	LTE B5	QPSK10M	20450	25	0	Rear Face	1	1	22	21.47	0.02	0.229	0.259	
T324	LTE B5	QPSK10M	20450	1	0	Rear Face	1	2	23	22.53	0.02	**0.349**	0.389	
T325	LTE B5	QPSK10M	20450	1	0	Rear Face	1	2	23	22.53	-0.01	0.324	0.361	CRO-L23
T326	LTE B5	QPSK10M	20450	1	0	Rear Face	2	2	23	22.53	0.02	0.313	0.349	
T350	LTE B7	QPKS20M	21350	1	0	Front Face	1	1	22.5	22.45	0.03	0.476	0.482	CRO-L03
T351	LTE B7	QPKS20M	21350	1	0	Rear Face	1	1	22.5	22.45	-0.01	**0.643**	0.650	
T352	LTE B7	QPKS20M	21350	50	0	Front Face	1	1	21.5	21.28	0.02	0.376	0.396	
T353	LTE B7	QPKS20M	21350	50	0	Rear Face	1	1	21.5	21.28	0.01	0.513	0.540	
T354	LTE B7	QPKS20M	21350	1	0	Rear Face	1	2	22.5	22.45	0.02	0.583	0.590	
T355	LTE B7	QPKS20M	21350	1	0	Rear Face	1	1	22.5	22.45	-0.04	0.293	0.296	CRO-L23
T356	LTE B7	QPKS20M	21350	1	0	Rear Face	2	1	22.5	22.45	-0.02	0.296	0.299	

3. Body-worn SAR test results of WIFI

Test No.	Band	CH	Test Position (with 15mm)	Battery	Data Rate	Power Setting	Tune up	Measured	Drift(dB)	SAR Value (W/kg)1-g	Reported SAR	Test Sample
T400	802.11b	11	Front Face	1	1	17	17	16.41	0.06	0.079	0.090	CRO-L03
T401	802.11b	11	Rear Face	1	1	17	17	16.41	0.03	0.121	0.139	
T402	802.11b	11	Rear Face	2	1	17	17	16.41	-0.06	0.113	0.129	
T409	802.11b	11	Rear Face	1	1	17	17	16.41	0.00	**0.138**	0.158	CRO-L23

8.2.3SAR MEASUREMENT RESULT OF HOTSPOT

1. Hotspot SAR test results of GSM&UMTS

Test No.	Band	Mode	CH	Test Position (with 10mm)	SIM	Battery	Tune up	Measured	Drift(dB)	SAR Value (W/kg)1-g	Reported SAR	Test Sample
T170	GSM 850	GPRS2TX	190	Front Face	1	1	32.5	32.01	-0.05	0.694	0.777	CRO-L03
T171	GSM 850	GPRS2TX	190	Rear Face	1	1	32.5	32.01	-0.06	1.010	1.131	
T172	GSM 850	GPRS2TX	190	Left Side	1	1	32.5	32.01	-0.07	0.689	0.771	
T173	GSM 850	GPRS2TX	190	Right Side	1	1	32.5	32.01	0.06	0.556	0.622	
T174	GSM 850	GPRS2TX	190	Bottom Side	1	1	32.5	32.01	0.05	0.096	0.107	
T175	GSM 850	GPRS2TX	128	Rear Face	1	1	32.5	31.92	0.01	0.921	1.053	
T176	GSM 850	GPRS2TX	251	Rear Face	1	1	32.5	32.03	0.00	**1.050**	1.170	
T177	GSM 850	GPRS2TX	251	Rear Face	1	2	32.5	32.03	-0.04	0.978	1.090	
T178	GSM 850	GPRS2TX	251	Rear Face （1st repeated）	1	1	32.5	32.03	-0.03	1.030	1.148	
T179	GSM 850	GPRS2TX	251	Rear Face	1	1	32.5	32.03	-0.02	0.815	0.908	CRO-L23
T180	GSM 850	GPRS2TX	251	Rear Face	2	1	32.5	32.03	0.04	0.867	0.966	
T195	GSM 1900	GPRS2TX	661	Front Face	1	1	29.5	28.3	0.02	0.438	0.577	CRO-L03
T196	GSM 1900	GPRS2TX	661	Rear Face	1	1	29.5	28.3	-0.05	0.737	0.972	
T197	GSM 1900	GPRS2TX	661	Left Side	1	1	29.5	28.3	-0.03	0.370	0.488	
T198	GSM 1900	GPRS2TX	661	Right Side	1	1	29.5	28.3	0.03	0.208	0.274	
T199	GSM 1900	GPRS2TX	661	Bottom Side	1	1	29.5	28.3	0.01	0.636	0.838	
T200	GSM 1900	GPRS2TX	512	Rear Face	1	1	29.5	28.27	0.01	0.705	0.936	
T201	GSM 1900	GPRS2TX	810	Rear Face	1	1	29.5	28.05	0.02	**0.709**	0.990	
T202	GSM 1900	GPRS2TX	512	Bottom Side	1	1	29.5	28.27	-0.05	0.596	0.791	
T203	GSM 1900	GPRS2TX	810	Bottom Side	1	1	29.5	28.05	-0.03	0.535	0.747	
T204	GSM 1900	GPRS2TX	810	Rear Face	1	2	29.5	28.05	0.02	0.680	0.950	
T205	GSM 1900	GPRS2TX	810	Rear Face	1	1	29.5	28.05	0.02	0.684	0.955	CRO-L23
T206	GSM 1900	GPRS2TX	810	Rear Face	2	1	29.5	28.05	0.01	0.666	0.930	
T216	UMTS B2	RMC12.2K	9400	Front Face	1	1	23	22.34	0.06	0.510	0.594	CRO-L03
T217	UMTS B2	RMC12.2K	9400	Rear Face	1	1	23	22.34	-0.06	0.776	0.903	
T218	UMTS B2	RMC12.2K	9400	Left Side	1	1	23	22.34	-0.02	0.389	0.453	
T219	UMTS B2	RMC12.2K	9400	Right Side	1	1	23	22.34	0.03	0.203	0.236	
T220	UMTS B2	RMC12.2K	9400	Bottom Side	1	1	23	22.34	0.04	0.725	0.844	
T221	UMTS B2	RMC12.2K	9262	Rear Face	1	1	23	21.98	-0.02	0.868	**1.098**	
T222	UMTS B2	RMC12.2K	9538	Rear Face	1	1	23	22.47	0.01	0.703	0.794	
T223	UMTS B2	RMC12.2K	9262	Bottom Side	1	1	23	21.98	0.03	0.782	0.989	
T224	UMTS B2	RMC12.2K	9538	Bottom Side	1	1	23	22.47	0.01	0.693	0.783	
T225	UMTS B2	RMC12.2K	9262	Rear Face	1	2	23	22.34	-0.03	0.901	1.049	
T227	UMTS B2	RMC12.2K	9262	Rear Face	1	2	23	22.65	-0.01	1.210	1.312	CRO-L23
T228	UMTS B2	RMC12.2K	9262	Rear Face	2	2	23	22.65	-0.01	**1.270**	1.377	
T229	UMTS B2	RMC12.2K	9262	Rear Face（with replaced holder）	2	2	23	22.65	-0.01	1.250	1.355	
T410	UMTS B2	RMC12.2K	9262	Rear Face（1st repeated）	2	2	23	22.65	-0.01	1.260	1.366	
T235	UMTS B5	RMC12.2K	4182	Front Face	1	1	23.5	22.52	0	0.170	0.213	CRO-L03
T236	UMTS B5	RMC12.2K	4182	Rear Face	1	1	23.5	22.52	0.02	0.222	0.278	
T237	UMTS B5	RMC12.2K	4182	Left Side	1	1	23.5	22.52	0.03	0.123	0.154	
T238	UMTS B5	RMC12.2K	4182	Right Side	1	1	23.5	22.52	0.01	0.137	0.172	

T239	UMTS B5	RMC12.2K	4182	Bottom Side	1	1	23.5	22.52	-0.02	0.029	0.036	
T240	UMTS B5	RMC12.2K	4182	Rear Face	1	2	23.5	22.52	-0.04	**0.233**	0.292	
T241	UMTS B5	RMC12.2K	4182	Rear Face	1	2	23.5	22.52	0.02	0.189	0.237	CRO-L23
T242	UMTS B5	RMC12.2K	4182	Rear Face	2	2	23.5	22.52	0.04	0.227	0.284	

2. Hotspot SAR test results of LTE

Test No.	Band	Mode	CH	RB	Offset	Test Position (with 10mm)	SIM	Battery	Tune up	Measured	Drift(dB)	SAR Value (W/kg)1-g	Reported SAR	Test Sample
T257	LTE B2	QPSK20M	19100	1	0	Front Face	1	1	23	22.7	0.03	0.411	0.440	
T258	LTE B2	QPSK20M	19100	1	0	Rear Face	1	1	23	22.7	-0.01	0.725	**0.777**	
T259	LTE B2	QPSK20M	19100	1	0	Left Side	1	1	23	22.7	0.02	0.276	0.296	
T260	LTE B2	QPSK20M	19100	1	0	Right Side	1	1	23	22.7	-0.04	0.179	0.192	
T261	LTE B2	QPSK20M	19100	1	0	Bottom Side	1	1	23	22.7	0.05	0.541	0.580	
T262	LTE B2	QPSK20M	18900	50	0	Front Face	1	1	22	21.57	0.06	0.325	0.359	CRO-L03
T263	LTE B2	QPSK20M	18900	50	0	Rear Face	1	1	22	21.57	0.08	0.585	0.646	
T264	LTE B2	QPSK20M	18900	50	0	Left Side	1	1	22	21.57	0.04	0.234	0.258	
T265	LTE B2	QPSK20M	18900	50	0	Right Side	1	1	22	21.57	0.00	0.129	0.142	
T266	LTE B2	QPSK20M	18900	50	0	Bottom Side	1	1	22	21.57	0.01	0.526	0.581	
T267	LTE B2	QPSK20M	19100	1	0	Rear Face	1	2	23	22.7	-0.06	0.685	0.734	
T268	LTE B2	QPSK20M	19100	1	0	Rear Face	1	1	23	22.7	0.01	**0.868**	0.930	
T269	LTE B2	QPSK20M	18700	1	0	Rear Face	1	1	23	22.03	-0.03	0.743	0.929	
T270	LTE B2	QPSK20M	18900	1	0	Rear Face	1	1	23	22.65	0.04	0.855	0.926	
T271	LTE B2	QPSK20M	18900	100	0	Rear Face	1	1	22	21.53	0.02	0.601	0.669	CRO-L23
T272	LTE B2	QPSK20M	19100	1	0	Rear Face	2	1	23	22.7	-0.02	0.818	0.877	
T273	LTE B2	QPSK20M	19100	1	0	Rear Face(1st repeated))	1	1	23	22.7	0.01	0.863	0.925	
T288	LTE B4	QPSK20M	20050	1	0	Front Face	1	1	22.5	22.44	0.03	0.582	0.590	
T289	LTE B4	QPSK20M	20050	1	0	Rear Face	1	1	22.5	22.44	-0.01	1.160	1.176	
T290	LTE B4	QPSK20M	20050	1	0	Left Side	1	1	22.5	22.44	0.05	0.156	0.158	
T291	LTE B4	QPSK20M	20050	1	0	Right Side	1	1	22.5	22.44	0.03	0.206	0.209	
T292	LTE B4	QPSK20M	20050	1	0	Bottom Side	1	1	22.5	22.44	0.09	1.040	1.054	
T293	LTE B4	QPSK20M	20050	50	0	Front Face	1	1	22	21.25	-0.03	0.470	0.559	
T294	LTE B4	QPSK20M	20050	50	0	Rear Face	1	1	22	21.25	0.01	0.827	0.983	
T295	LTE B4	QPSK20M	20050	50	0	Left Side	1	1	22	21.25	-0.04	0.146	0.174	
T296	LTE B4	QPSK20M	20050	50	0	Right Side	1	1	22	21.25	0.02	0.164	0.195	
T297	LTE B4	QPSK20M	20050	50	0	Bottom Side	1	1	22	21.25	0.03	0.673	0.800	
T298	LTE B4	QPSK20M	20175	1	0	Rear Face	1	1	22.5	22.06	0.08	1.060	1.173	
T299	LTE B4	QPSK20M	20300	1	0	Rear Face	1	1	22.5	21.47	0.05	0.870	1.103	CRO-L03
T300	LTE B4	QPSK20M	20175	1	0	Bottom Side	1	1	22.5	22.06	0.06	1.000	1.107	
T301	LTE B4	QPSK20M	20300	1	0	Bottom Side	1	1	22.5	21.47	-0.07	0.887	1.124	
T302	LTE B4	QPSK20M	20175	50	50	Rear Face	1	1	22	20.98	0.06	0.794	1.004	
T303	LTE B4	QPSK20M	20300	50	50	Rear Face	1	1	22	20.62	-0.03	0.630	0.866	
T304	LTE B4	QPSK20M	20175	50	50	Bottom Side	1	1	22	20.98	0.01	0.766	0.969	
T305	LTE B4	QPSK20M	20300	50	50	Bottom Side	1	1	22	20.62	-0.06	0.687	0.944	
T306	LTE B4	QPSK20M	20050	1	0	Rear Face	1	2	22.5	22.44	-0.05	**1.220**	1.237	
T307	LTE B4	QPSK20M	20050	1	0	Rear Face（with replaced holder）	1	2	22.5	22.44	0.05	1.180	1.196	
T308	LTE B4	QPSK20M	20050	1	0	Rear Face（1st	1	1	22.5	22.44	0.03	1.210	1.227	

						repeated）								
T309	LTE B4	QPSK20M	20050	100	0	Rear Face	1	1	22	21.5	0.06	0.755	0.847	
T310	LTE B4	QPSK20M	20050	100	0	Bottom Side	1	1	22	21.5	0.06	0.687	0.771	
T311	LTE B4	QPSK20M	20050	1	0	Rear Face	1	2	22.5	22.44	0.03	0.915	0.928	CRO-L23
T312	LTE B4	QPSK20M	20050	1	0	Rear Face	2	2	22.5	22.44	-0.06	0.887	0.899	
T330	LTE B5	QPSK10M	20450	1	0	Front Face	1	1	23	22.53	-0.02	0.227	0.253	CRO-L03
T331	LTE B5	QPSK10M	20450	1	0	Rear Face	1	1	23	22.53	0.01	0.308	0.343	
T332	LTE B5	QPSK10M	20450	1	0	Left Side	1	1	23	22.53	0.05	0.199	0.222	
T333	LTE B5	QPSK10M	20450	1	0	Right Side	1	1	23	22.53	0.03	0.183	0.204	
T334	LTE B5	QPSK10M	20450	1	0	Bottom Side	1	1	23	22.53	-0.03	0.051	0.057	
T335	LTE B5	QPSK10M	20450	25	0	Front Face	1	1	22	21.47	0.01	0.185	0.209	
T336	LTE B5	QPSK10M	20450	25	0	Rear Face	1	1	22	21.47	0.02	0.253	0.286	
T337	LTE B5	QPSK10M	20450	25	0	Left Side	1	1	22	21.47	-0.03	0.128	0.145	
T338	LTE B5	QPSK10M	20450	25	0	Right Side	1	1	22	21.47	0.01	0.146	0.165	
T339	LTE B5	QPSK10M	20450	25	0	Bottom Side	1	1	22	21.47	0.02	0.029	0.033	
T340	LTE B5	QPSK10M	20450	1	0	Rear Face	1	2	23	22.53	0.00	**0.386**	0.430	
T341	LTE B5	QPSK10M	20450	1	0	Rear Face	1	2	23	22.53	0.02	0.354	0.394	CRO-L23
T342	LTE B5	QPSK10M	20450	1	0	Rear Face	2	2	23	22.53	0.06	0.353	0.393	
T360	LTE B7	QPSK20M	21350	1	0	Front Face	1	1	21.5	21.11	0.08	0.518	0.567	CRO-L03
T361	LTE B7	QPSK20M	21350	1	0	Rear Face	1	1	21.5	21.11	-0.01	0.592	0.648	
T362	LTE B7	QPSK20M	21350	1	0	Left Side	1	1	21.5	21.11	0.02	0.165	0.181	
T363	LTE B7	QPSK20M	21350	1	0	Right Side	1	1	21.5	21.11	0.03	0.221	0.242	
T364	LTE B7	QPSK20M	21350	1	0	Bottom Side	1	1	21.5	21.11	0.08	**1.070**	1.171	
T365	LTE B7	QPSK20M	21350	50	0	Front Face	1	1	21.5	21.01	0.09	0.508	0.569	
T366	LTE B7	QPSK20M	21350	50	0	Rear Face	1	1	21.5	21.01	-0.06	0.498	0.557	
T367	LTE B7	QPSK20M	21350	50	0	Left Side	1	1	21.5	21.01	0.01	0.162	0.181	
T368	LTE B7	QPSK20M	21350	50	0	Right Side	1	1	21.5	21.01	0.04	0.204	0.228	
T369	LTE B7	QPSK20M	21350	50	0	Bottom Side	1	1	21.5	21.01	-0.03	1.030	1.153	
T372	LTE B7	QPSK20M	20850	1	99	Bottom Side	1	1	21.5	20.9	0.05	0.829	0.952	
T373	LTE B7	QPSK20M	21100	1	99	Bottom Side	1	1	21.5	21.04	0.02	0.956	1.063	
T376	LTE B7	QPSK20M	20850	50	50	Bottom Side	1	1	21.5	20.77	0.02	0.870	1.029	
T377	LTE B7	QPSK20M	21100	50	0	Bottom Side	1	1	21.5	21.01	-0.06	0.943	1.056	
T378	LTE B7	QPSK20M	21350	1	0	Bottom Side	1	2	21.5	21.11	0.01	1.020	1.116	
T378	LTE B7	QPSK20M	21350	1	0	Bottom Side（1st repeated）	1	1	21.5	21.11	0.01	1.040	1.138	
T380	LTE B7	QPSK20M	21350	100	0	Bottom Side	1	1	21.5	20.99	0.02	0.992	1.116	
T382	LTE B7	QPSK20M	21350	1	0	Bottom Side	1	1	21.5	21.11	-0.04	0.575	0.629	CRO-L23
T383	LTE B7	QPSK20M	21350	1	0	Bottom Side	2	1	21.5	21.11	-0.01	0.691	0.756	

Note: According to 201610 FCC TCB workshop RF exposure slides, when the highest reported SAR of an antenna is ＞1.2W/kg, holder perturbation verification is required for each antenna, using the highest SAR configuration among all applicable frequency bands.

3. Hotspot SAR test results of WIFI

Test No.	Band	CH	Test Position (with 10mm)	Battery	Data Rate	Power Setting	Tune up	Measured	Drift(dB)	SAR Value (W/kg)1-g	Reported SAR	Test Sample
T403	802.11b	11	Front Face	1	1	17	17	16.41	0.03	0.147	0.168	CRO-L03
T404	802.11b	11	Rear Face	1	1	17	17	16.41	-0.06	0.235	0.269	
T405	802.11b	11	Right Side	1	1	17	17	16.41	-0.07	0.044	0.050	
T406	802.11b	11	Top Side	1	1	17	17	16.41	-0.07	0.246	0.282	
T407	802.11b	11	Top Side	2	1	17	17	16.41	0.06	0.243	0.278	
T408	802.11b	11	Top Side	1	1	17	17	16.41	0.01	**0.282**	0.323	CRO-L23

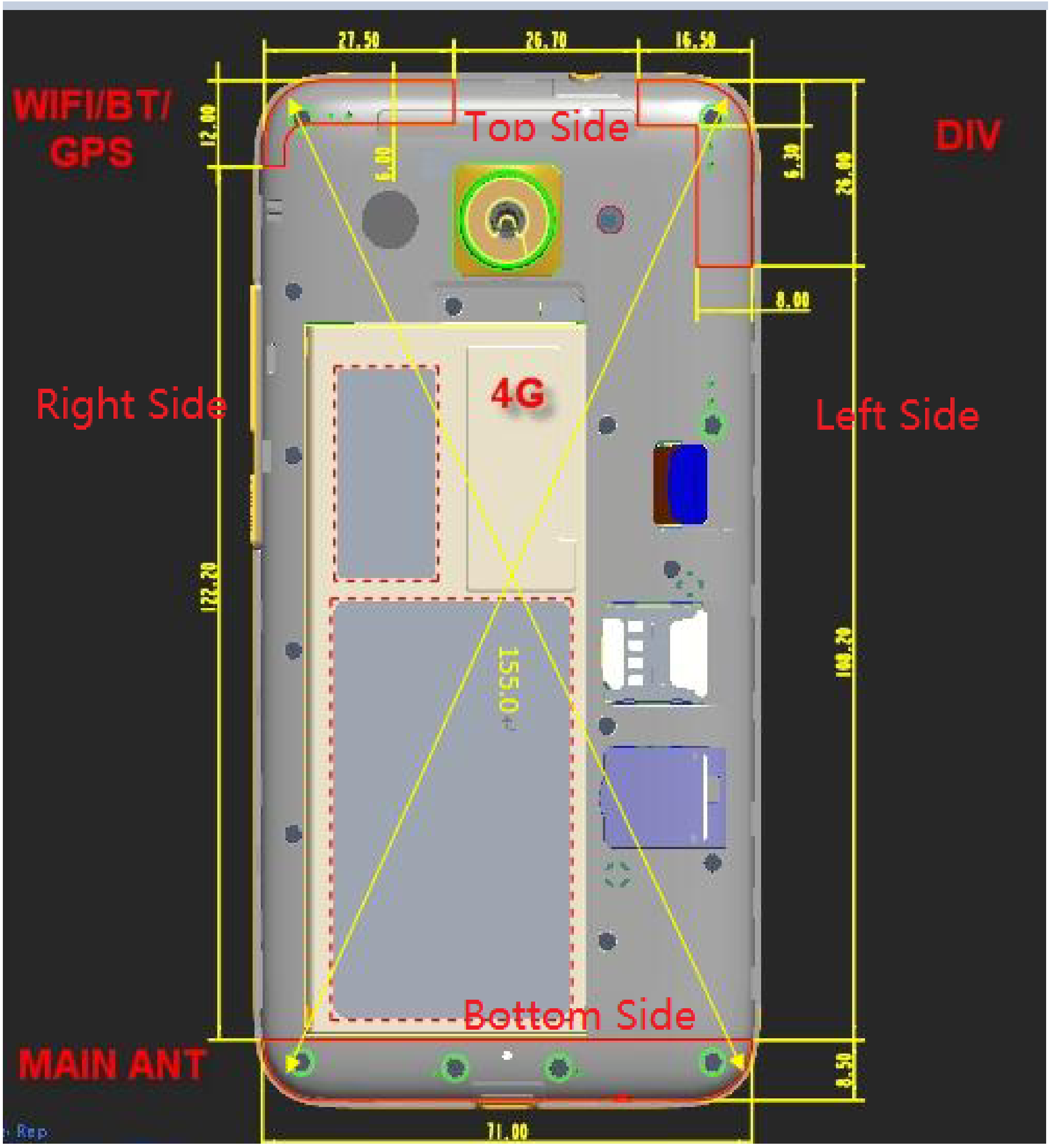
Note: Per KDB248227 D01, the highest SAR measured for the initial test position or initial test configuration should be used to determine SAR test exclusion according to the sum of 1-g SAR and SAR peak to location ratio provisions in KDB 447498. In addition, a test lab may also choose to perform standalone SAR measurements for test positions and 802.11 configurations that are not required by the initial test position or initial test configuration procedures and apply the results to determine simultaneous transmission SAR test exclusion, according to sum of 1-g and SAR peak to location ratio requirements to reduce the number of simultaneous transmission SAR measurements.

8.3 MULTIPLE TRANSMITTER EVALUATION

The following tables list information which is relevant for the decision if a simultaneous transmit evaluation is necessary according to FCC KDB 447498 D01 General RF Exposure Guidance.

The length of the diagonal of the mobile phone is 155mm.

The location of the antennas inside mobile phone is shown as below picture:



Note: The Div antenna is used to improve the acceptance of performance of the main antenna, it does not have a transmitter function.

8.3.1STAND-ALONE SAR TEST EXCLUSION

Per FCC KDB 447498 D01, the 1-g SAR 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 product specific 10-g SAR, where:

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

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Standalone SAR test exclusion for BT

Mode	Position	P_{max} (dBm)*	P_{max} (mW)	Distance (mm)	f (GHz)	Calculation Result	SAR Exclusion threshold	SAR test exclusion
BT	Body-Worn	9	7.94	15	2.48	0.83	3	Yes

Note:

1)* - maximum possible output power declared by manufacturer

2) Held to ear configurations are not applicable to Bluetooth for this device.

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.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

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

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

Estimated SAR calculation

Mode	Position	P_{max} (dBm)*	P_{max} (mW)	Distance (mm)	f (GHz)	X	Estimated SAR (W/kg)*
BT	Body-Worn	9	7.94	15	2.48	7.5	0.111

Note: * - maximum possible output power declared by manufacturer

8.3.2STAND-ALONE SAR TEST EXCLUSION

Per FCC KDB 447498D01, SAR compliance for simultaneous transmission must be considered when the maximum duration of overlapping transmissions, including network hand-offs, is greater than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis.

The Simultaneous Transmission Possibilities of this device are as below:

No.	Configuration	Head	Body-worn	Hotspot
1	GSM (Voice) + WiFi 2.4G	Yes	Yes	N/A
2	GPRS/EDGE (DATA) + WiFi 2.4G	N/A	N/A	Yes
3	GSM(Voice) +BT	N/A	Yes	N/A
4	GPRS/EDGE(DATA)+BT	N/A	N/A	N/A
5	WCDMA(Voice)+WiFi 2.4G	Yes	Yes	N/A
6	WCDMA(DATA)+WiFi 2.4G	N/A	Yes	Yes
7	WCDMA(Voice)+BT	N/A	Yes	N/A
8	WCDMA(DATA)+BT	N/A	Yes	N/A
9	LTE(DATA)+WiFi 2.4G	Yes*	Yes*	Yes
10	LTE(DATA)+BT	N/A	Yes*	N/A

Note:
i)* VOIP 3rd party applications may possibly be installed and used by the end user.
ii) Wi-Fi 2.4G and Bluetooth share the same antenna and can’t transmit simultaneously.
iii) 2G&3G&4G share the same antenna and can’t transmit simultaneously.
iv) The device does not support DTM function.
v) Held to ear configurations are not applicable to Bluetooth and therefore were not considered for simultaneous transmission.
vi) The device supports VoLTE function.

8.3.3 SAR SUMMATION SCENARIO

About BT/ WiFi and GSM/UMTS/LTE antenna

Test Position / Reported SAR_{1g}	Head				Body-Worn		Hotspot					
	Right Cheek	Right Tilted	Left Cheek	Left Tilted	Front	Rear	Front	Rear	Left	Right	Top	Bottom
GSM850	0.388	0.287	0.426	0.248	0.465	0.588	0.777	1.170	0.771	0.622	-	0.107
GSM1900	0.240	0.180	0.387	0.168	0.194	0.295	0.577	0.990	0.488	0.274	-	0.838
UMTS B2	0.270	0.194	0.386	0.156	0.327	0.693	0.594	1.377	0.453	0.236	-	0.989
UMTS B5	0.333	0.211	0.343	0.213	0.063	0.127	0.213	0.292	0.154	0.172	-	0.036
LTE B2	0.350	0.208	0.312	0.180	0.267	0.368	0.440	0.930	0.296	0.192	-	0.581
LTE B4	0.273	0.188	0.258	0.161	0.318	0.706	0.590	1.237	0.174	0.209	-	1.054
LTE B5	0.222	0.156	0.294	0.160	0.241	0.389	0.253	0.430	0.222	0.204	-	0.057
LTE B7	0.404	0.153	0.591	0.243	0.482	0.650	0.569	0.648	0.181	0.242	-	1.171
BT	-	-	-	-	**0.111**	**0.111**	-	-	-	-	-	-
WiFi 2.4G	0.387	0.361	0.802	0.718	0.090	0.158	0.168	0.273	-	0.050	0.323	-
MAX∑SAR1g	0.791	0.648	1.393	0.966	0.593	0.864	0.945	**1.650**	0.771	0.672	0.323	1.171

Reported SAR1g / Test Position	GSM850	GSM1900	UMTS B2	UMTS B5	LTE B2	LTE B4	LTE B5	LTE B7	2.4G WiFi	MAX $\sum SAR_{1g}$
Rear Face	1.170	/	/	/	/	/	/	/	0.273	1.443
	/	0.990	/	/	/	/	/	/	0.273	1.263
	/	/	1.377	/	/	/	/	/	0.273	**1.650**
	/	/	/	0.292	/	/	/	/	0.273	0.565
	/	/	/	/	0.930	/	/	/	0.273	1.203
	/	/	/	/	/	1.237	/	/	0.273	1.510
	/	/	/	/	/	/	0.430	/	0.273	0.703
	/	/	/	/	/	/	/	0.648	0.273	0.921

8.3.4 SIMULTANEOUS TRANSMISSION CONLCUSION

According to KDB447498 D01, When the sum of SAR is larger than limit, SAR test exclusion is determined by the SAR to peak location separation ratio(SPLSR).When the SAR to peak location ratio for each pair of antennas is 0.04 for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion. When 10-g SAR applies, the ratio must be ≤ 0.10.

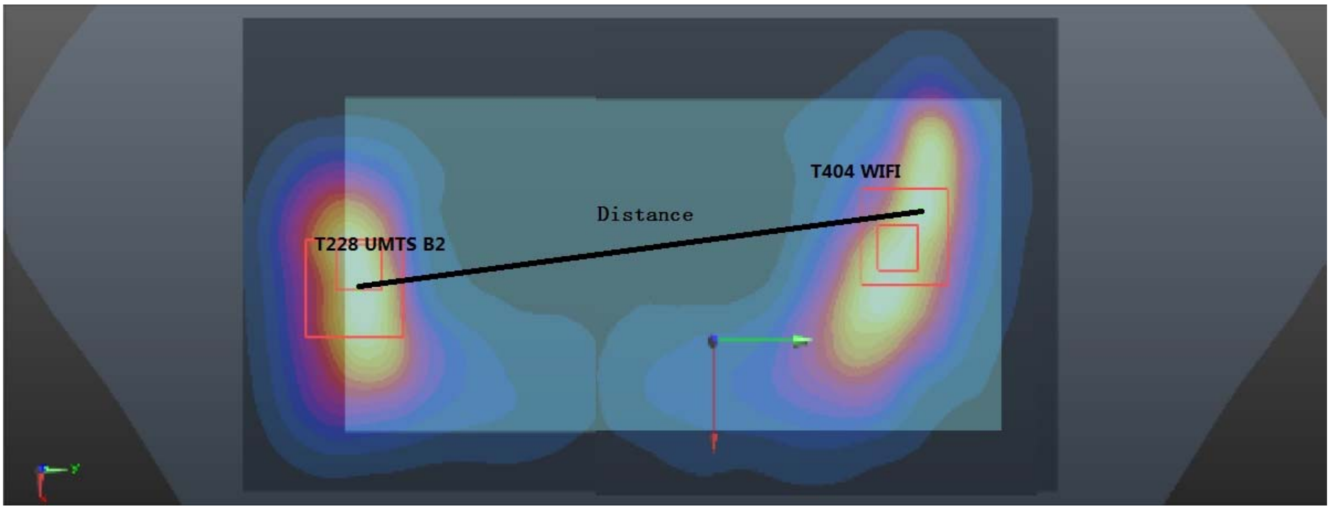
When SAR is measured for both antennas in the pair the peak location separation distance is computed by the following formula:

$$\text{Distance}_{Tx1\text{-}Tx2} = R_i = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

$$\text{SPLS Ratio} = (SAR_1 + SAR_2)^{1.5}/R_i$$

When standalone test exclusion applies, SAR is estimated; the peak location is assumed to be at the feed-point or geometric center of the antenna. Due to curvatures on the SAM phantom, when SAR is estimated for one of the antennas in an antenna pair, the measured peak SAR location should be translated onto the test device to determine the peak location separation for the antenna pair. The ERP location on the phantom is aligned with the ERP location on the handset, with 6mm separation in the z coordinate due to the ear spacer. A measured peak location can be translated onto the handset, with respect to the ERP location, by ignoring the 6 mm offset in the z coordinate. The assumed peak location of the antenna with estimated SAR can also be determined with respect to the ERP location on the handset. The peak location separation distance is estimated by the x and y coordinated of the peaks, referenced to the ERP location. While flat phantoms are not expected to have these issues, the same peak translation approach should be applied to determine peak location separation.

1） The sum of aggregate 1g SAR was above 1.6 W/kg for Rear face configuration with UMTS B2 and WiFi 2.4G.
The Peak SAR location is as below:



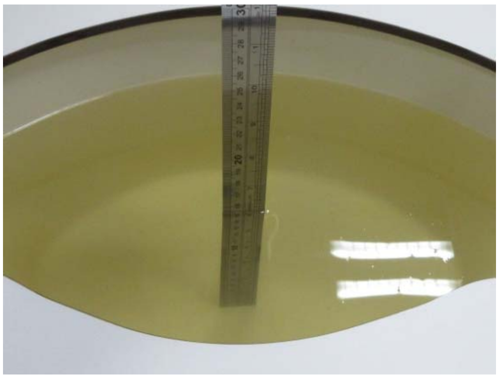
Mode	Reported SAR1g mW/g	Peak SAR1g mW/g	X m	Y m	Z m	distance(mm)	SPLSR	Ratio Limit	Simultaneous SAR
UMTS B2	1.377	1.430	-0.0198	-0.0695	-0.204	122.7	0.017	0.04	No
2.4GWiFi	0.273	0.271	-0.037	0.052	-0.204				

APPENDIX

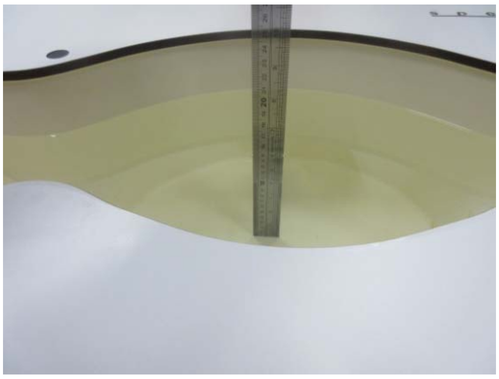
1. Test Layout

Specific Absorption Rate Test Layout

Liquid depth in the flat Phantom (≥15cm depth)

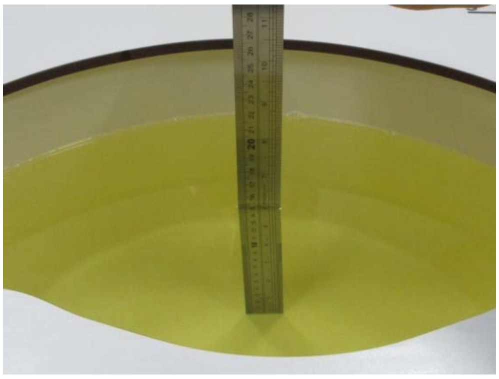
Body(835MHz) 15.5cm	Head(835MHz) 15.9cm
	

Body(1750MHz) 15.4cm

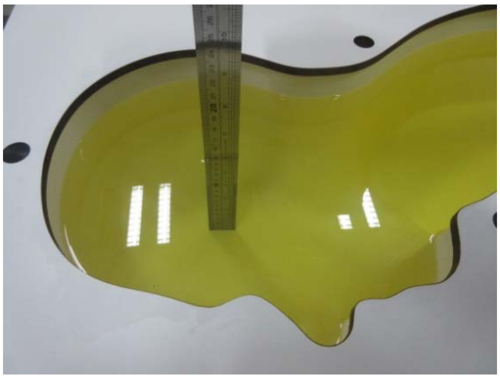


Head(1750MHz) 15.9cm

Body(1900MHz~2600 MHz) 15.5cm



Head (1900MHz~2600MHz) 15.1cm



Appendix A. SAR Plots of System Verification

(Pls See Appendix A.)

Appendix B. SAR Plots of SAR Measurement

(Pls See Appendix B.)

Appendix C. Calibration Certificate for Probe and Dipole

(Pls See Appendix C.)

Appendix D. Photographs of the Test Set-Up

(Pls See Appendix D.)

End