SAR TEST REPORT

For

Alcatel LINKZONE™

Model Number: MW41TM

FCC ID: 2ACCJB071

Report Number: WT168003435

Test Laboratory	:	Shenzhen Academy of Metrology and Quality Inspection National Digital Electronic Product Testing Center
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Test report declaration

Applicant	:	TCL Communication Ltd
Address	:	5F, C-Tower,No.232,Liangjing Road, Zhangjiang High-tech Park, Pudong, Shanghai,China
Manufacturer	:	TCL Mobile Communication Co. Ltd. Huizhou
Address	:	70 Huifeng 4rd., ZhongKai High-Technology Development District, Huizhou, Guangdong, PRC. 516006
EUT Description	:	Alcatel LINKZONE™
Model No	:	MW41TM
Trade mark	:	Alcatel
FCC ID	:	2ACCJB071

Test Standards:

IEEE Std 1528-2013, KDB941225 D01, KDB941225 D05, KDB941225 D06, KDB447498 D01,KDB648474 D04,KDB248227 D01,KDB 865664 D01,KDB865664 D02,KDB690783 D01

The EUT described above is tested by Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory to determine the compliance of the applicable standards stated above. Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory is assumed full responsibility for the accuracy of the test results.

The results documented in this report only apply to the tested sample, under the conditions and modes of operation as described herein.

The test report shall not be reproduced in part without written approval of the laboratory.

Project Engineer:	(Zhou Li)	Date:	Aug 01,2016
Checked by:	(Lin Yixiang)	Date:	Aug 01,2016
Approved by:	(Lin Bin)	Date:	Aug 01,2016

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1. REPORTED SAR SUMMARY

1.1. Statement of Compliance

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

Band	Max Reported SAR(W/kg)
	1-g Hotspot(10mm)
GSM850	0.823
GSM1900	0.477
UMTS Band II	0.441
UMTS Band IV	0.59
UMTS Band V	0.507
LTE Band 2	0.589
LTE Band 4	0.357
LTE Band 12	0.999
Wi-Fi 2.4G	0.339
The highest simultaneous SAR value is 1.338 W/kg per KDB690783-D01	

Table 1: Summary of test result

Note:

*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.

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/IEEE C95.1:1992, the NCRP Report Number 86 for uncontrolled environment, according to the Industry Canada Radio Standards Specification RSS-102 for General Population/ Uncontrolled exposure, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013& IEEE Std 1528a-2005.

1.2. RF exposure limits (ICNIRP Guidelines)

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Spatial Peak SAR*(Brain/Body)	**1.60mW/g**	8.00mW/g
Spatial Average SAR** (Whole Body)	0.08mW/g	0.40mW/g
Spatial Peak SAR***(Limbs)	4.00mW/g	20.00mW/g

Table 2: RF exposure limits

The limit applied in this test report is shown in bold letters

Notes:

* The Spatial Peak value of the SAR averaged over any 1 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time

** The Spatial Average value of the SAR averaged over the whole body.

*** The Spatial Peak value of the SAR averaged over any 1 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure,(i.e. as a result if employment or occupation.)

1.3 Ratings and System Details

Device type :	Portable Device
DUT Name:	Alcatel LINKZONE™
Type Identification:	MW41TM
IMEI No :	0.14734000003481
Exposure category:	Uncontrolled environment / General population
Test Device Production information	Production Unit
Operating Mode(s)	GSM850/1900,UMTS Band II/IV/V,LTE Band 2/4/12,WiFi2.4G
Test modulation	GSM/GPRS(GMSK),EDGE(8PSK),UMTS(QPSK), LTE(QPSK,16QAM),Wi-Fi(OFDM/DSSS)
Device Class :	B
HSDPA Category	14
HSUPA Category	6
DC-HSDPA Category	24
LTE Release Rel	9

Operating Frequency Range(s)	Transmitter Frequency Range	Receiver Frequency Range
GSM850 (tested):	824.2-848.8 MHz	869.2-893.8 MHz
GSM1900 (tested):	1850.2-1909.8 MHz	1930.2-1989.8 MHz
UMTS Band II (tested):	1852.5-1907.6 MHz	1932.5-1987.6MHz
UMTS Band IV (tested):	1712.4-1752.6 MHz	2112.4-2152.6 MHz
UMTS Band V (tested):	826.4-846.6 MHz	871.4-891.6 MHz
LTE Band 2(tested)	1850-1910 MHz	1930-1990 MHz
LTE Band 4(tested)	1710-1755 MHz	2110-2155 MHz
LTE Band 12(tested)	699.7-711 MHz	729.7-741 MHz
Wi-Fi(tested):	2400-2483.5 MHz	
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 II)	
	3, tested with power control “all 1”(UMTS Band IV)	
	3, tested with power control “all 1”(UMTS Band V)	
	3 tested with power control all Max(LTE Band 2)	
	3 tested with power control all Max(LTE Band 4)	
	3 tested with power control all Max(LTE Band 12)	
Test Channels (low-mid-high) :	128-190-251(GSM850)	
	512-661-810(GSM1900)	
	9262-9400-9538(UMTS Band II)	
	1313-1450-1512(UMTS Band IV)	
	4132-4183-4233(UMTS Band V)	
	18607-18900-19193(LTE Band 2,1.4MHz)	
	18615-18900-19185(LTE Band 2,3MHz)	
	18625-18900-19175(LTE Band 2,5MHz)	
	18650-18900-19150(LTE Band 2,10MHz)	
	18675-18900-19125(LTE Band 2,15MHz)	
	18700-18900-19100(LTE Band 2,20MHz)	
	19957-20175-20393(LTE Band 4,1.4MHz)	
	19965-20175-20385(LTE Band 4,3MHz)	
	19975-20175-20375(LTE Band 4,5MHz)	
	20000-20175-20350(LTE Band 4,10MHz)	
	20025-20175-20325(LTE Band 4,15MHz)	
	20050-20175-20300(LTE Band 4,20MHz)	
	23017-23095-23173(LTE Band 12,1.4MHz)	
	23025-23095-23165(LTE Band 12,3MHz)	
	23035-23095-23155(LTE Band 12,5MHz)	
	23060-23095-23130(LTE Band 12,10MHz)	

	1-6-11(Wi-Fi 802.11b)	
Hardware version :	V2.0	
Software version :	MW41_00_02.00_17	
Antenna type :	Integrated Antenna	
Battery options :	BYD Lithium Battery Co.,Ltd.	BYD Lithium Battery Co.,Ltd. Li-polymer Battery Battery Model: TLiB5AF Rated capacity: Nominal Voltage: ⎓ +3.70V Charge Voltage: ⎓ +4.2V

1.4 Product Function and Intended Use

MW41TM is subscriber equipment in the WCDMA/GSM/LTE system.
The HSPA+/HSUPA/HSDPA/UMTS frequency band is Band II, Band IV and Band V. Band II, Band IV and Band V can be used in this report. The GSM/GPRS/EDGE frequency band includes GSM850 and PCS1900, but only GSM850MHz and DCS1900MHz bands test data included in this report. The LTE frequency band is Band 2, Band 4, Band 12, all can be used in this report.
The Mobile Phone implements such functions as RF signal receiving/transmitting, HSPA+/HSUPA/HSDPA/UMTS and GSM/GPRS/EDGE protocol processing, voice, video, MMS service, GPS, AGPS and WIFI etc. Externally it provides micro SD card interface, earphone port (to provide voice service) and Micro USIM card interface.

1.5 Test specification(s)

ANSI Std C95.1-1992	Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz-300GHz.(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
IEEE Std 1528a-2005	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate(SAR) in the Human head from Wireless Communications Devices: Measurement Techniques Amendment1: CAD File for Human Head Model(SAM Phantom)
KDB941225 D01 SAR test for 3G devices v03r01	3G SAR MEAUREMENT PROCEDURES
KDB941225 D05 SAR for LTE Devices v02r05	SAR Evaluation Considerations for LTE Devices
KDB941225 D06 Hotspot Mode v02r01	SAR Evaluation Procedures for portable Devices with Wireless Router Capabilities
KDB447498 D01 General RF Exposure Guidance v06	Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
KDB 648474 D04 Handset SAR v01r03	SAR Evaluation Considerations for Wireless Handsets.
KDB 248227 D01 802 11 Wi-Fi SAR v02r02	SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS
KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04	SAR Measurement Requirements for 100 MHz to 6 GHz
KDB 865664 D02 RF Exposure Reporting v01r02	RF Exposure Compliance Reporting and Documentation Considerations
KDB 690783 D01 SAR Listings on Grants v01r03	SAR Listings on Equipment Authorization Grants

1.6 List of Test and Measurement Instruments

No	Equipment	Model No.	Serial No.	Manufacturer	Last Calibration Date	Period
1	SAR test system	TX60L	F08/5AY8A1/A/01+F08/	SPEAG	NCR	NCR
2	Electronic Data Transmitter	DAE4	876	SPEAG	2015.03.09	1year
3	SAR Probe	ES3DV3	3203	SPEAG	2016.01.12	1year
4	SAR Probe	EX3DV4	3881	SPEAG	2015.07.24	1year
5	Software	85070	--	SPEAG	--	--
6	Software	DASY5	--	SPEAG	--	--
7	System Validation Dipole,835MHz	D835V2	4d141	SPEAG	2015.09.24	3year
8	System Validation Dipole,1900MHz	D1900V2	5d162	SPEAG	2015.09.16	3year
9	System Validation Dipole,2450MHz	D2450V2	818	SPEAG	2015.09.14	3year
10	System Validation Dipole,750MHz	D750V3	1103	SPEAG	2014.01.14	3year
11	System Validation Dipole,1750MHz	D1750V2	1108	SPEAG	2014.01.09	3year
12	Dielectric Probe Kit	85070E	MY44300455	Agilent	NCR	NCR
13	Dual-directional coupler,0.10-2.0GHz	778D	MY48220198	Agilent	NCR	NCR
14	Dual-directional coupler,2.00-18GHz	772D	MY46151160	Agilent	NCR	NCR
15	Coaxial attenuator	8491A	MY39266348	Agilent	NCR	NCR
16	Power Amplifier	ZHL42W	81709	MINI-CIRCUITS	NCR	NCR
17	Signal Generator	SMR20	100047	R&S	2016.04.25	1year
18	Power Meter	NRVD	100041	R&S	2016.04.25	1year
19	Call Tester	CMU 200	100110	R&S	2015.12.06	1year
20	Network Analyzer	E5071C	MY46109550	Agilent	2016.04.22	1Year
21	Flat Phantom	ELI4.0	TP-1904	SPEAG	NCR	NCR
22	Twin Phantom	SAM	TP-1504	SPEAG	NCR	NCR
23	Wideband Radio Communication Tester	CMW500	125469	R&S	2015.10.29	1Year

Table 3: List of Test and Measurement Equipment

Note: All the test equipments are calibrated once a year, except the dipoles, which are calibrated every three years. Moreover, we have self-calibration every year to the dipoles.

2. GENERAL INFORMATION

2.1. Report information

This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that SMQ approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that SMQ in any way guarantees the later performance of the product/equipment.

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Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through SMQ, unless the applicant has authorized SMQ in writing to do so.

2.2. Laboratory Accreditation and Relationship to Customer

The testing report were performed by the Shenzhen Academy of Metrology and quality Ins pection EMC Laboratory (Guangdong EMC compliance testing center), in their facilities loc ated at NETC Building, No.4 Tongfa Rd., Xili, Nanshan, Shenzhen, China. At the time of te sting, Laboratory is accredited by the following organizations:

China National Accreditation Service for Conformity Assessment (CNAS) accredits the Lab oratory for conformance to FCC standards, EMC international standards and EN standard s. The Registration Number is CNAS L0579.

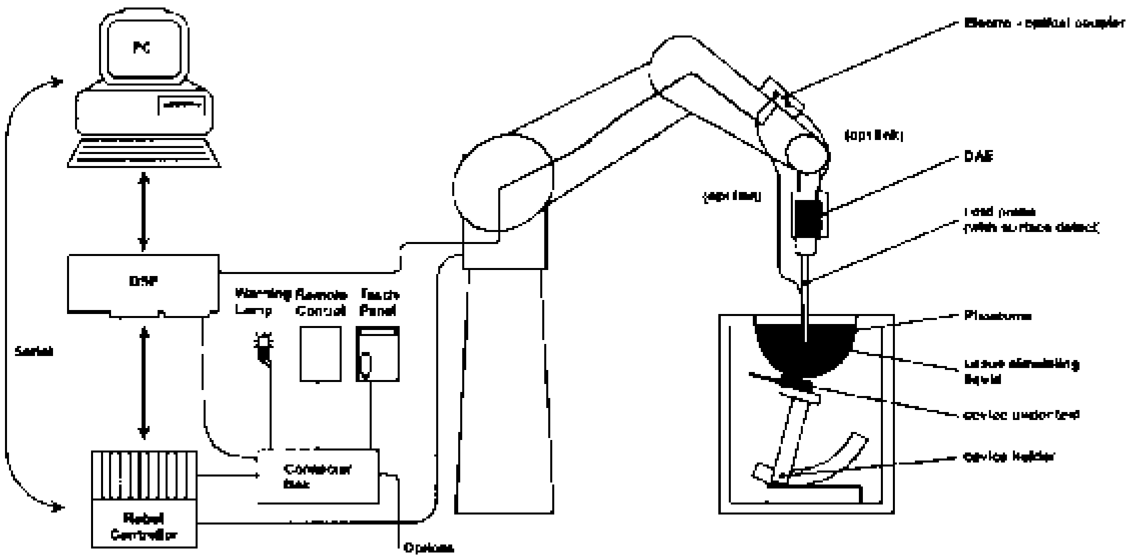
The Laboratory is listed in the United States of American Federal Communications Commi ssion (FCC), and the registration number are 446246 806614 994606(semi anechoic cham ber).

The Laboratory is registered to perform emission tests with Industry Canada (IC), and the r egistration number is 11177A-1 11177A-2.

TUV Rhineland accredits the Laboratory for conformance to IEC and EN standards, the re gistration number is E2024086Z02.

3. SAR MEASUREMENT SYSTEM CONFIGURATION

3.1. SAR Measurement Set-up



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

● A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
● 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.
● 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.
● A unit to operate the optical surface detector which is connected to the EOC.
● 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.
● The DASY5 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 XP.
● DASY5 software and SEMCAD data evaluation software.
Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.

- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- System checks dipoles allowing validating the proper functioning of the system.
- Test environment
- The DASY5 measurement system is placed at the head end of a room with dimensions:

4.5 x 4 x 3 m³, the SAM phantom is placed in a distance of 1.3 m from the side walls and 1.1m from the rear wall.

Picture 1 of the photo documentation shows a complete view of the test environment.

3.2. Probe description

Isotropic E-Field Probe EX3DV4 for Dosimetric Measurements

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 (dosimetry); 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: ± 0.2 dB (noise: typically<1 μW/g)	
Dimensions	Overall length: 337 mm (Tip: 20mm) Tip length: 2.5 mm (Body: 12mm) Typical distance from probe tip to dipole centers: 1mm	
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.	

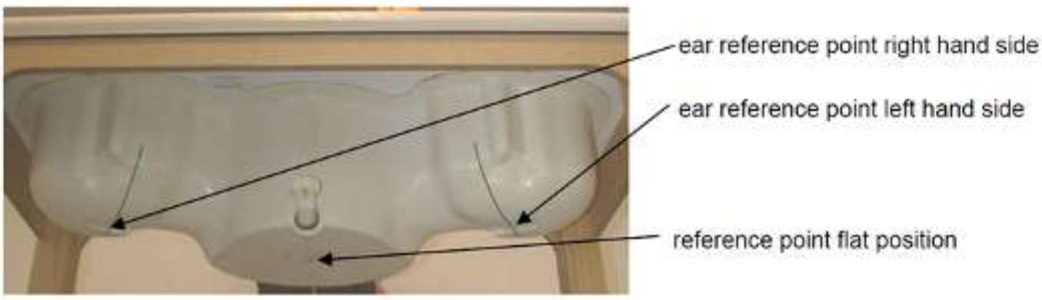
Isotropic E-Field Probe ES3DV3 for Dosimetric Measurements

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 4 GHz; Linearity: ± 0.2 dB (30 MHz to 4 GHz)	
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)	
Dynamic range	5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB	
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm	
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones	

3.3. Phantom description

The used SAM Phantom meets the requirements specified in Edition 01-01 of Supplement C to OET Bulletin 65 for Specific Absorption Rate (SAR) measurements.

The phantom consists of a fibreglass shell integrated in a wooden table. It allows left-hand and right-hand head as well as body-worn measurements with a maximum liquid depth of 18 cm in head position and 22 cm in planar position (body measurements). The thickness of the Phantom shell is 2 mm +/- 0.1 mm.



ELI4 Phantom

Shell Thickness	2mm+/- 0.2mm
Filling Volume	Approximately 30 liters
Measurement Areas	Flat phantom
The ELI4 phantom is in intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30MHz to 6GHz. ELI4 is fully compatible with the lastest draft of the standard IEC 62209-2 and all known tissue simulating liquids.	

The phantom shell material is resistant to all ingredients used in the tissue-equivalent liquid recipes. The shell of the phantom including ear spacers is constructed from low permittivity and low loss material, with a relative permittivity≤5 and a loss tangent ≤0.05.

3.4. Device holder description

The DASY5 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. This device holder is used for standard mobile phones or PDA's only. If necessary an additional support of polystyrene material is used.

Larger DUT's (e.g. notebooks) cannot be tested using this device holder. Instead a support of bigger polystyrene cubes and thin polystyrene plates is used to position the DUT in all relevant positions to find and measure spots with maximum SAR values.

Therefore those devices are normally only tested at the flat part of the SAM.

4. SAR MEASUREMENT PROCEDURE

4.1. Scanning procedure

- The DASY5 installation includes predefined files with recommended procedures for measurements and system check. 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°.)
- 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 strenth 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.

Results of this coarse scan are shown in Appendix B.

● 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: Δxzoom, Δyzoom ≤2GHZ≤ 8 mm, 2-4GHz - ≤ 5 mm and 4-6 GHz-≤ 4 mm; Δzzoom ≤ 3GHz - ≤ 5 mm, 3-4 GHz- ≤ 4 mm and 4-6GHz-≤2mm where the robot additionally moves the probe along the z-axis away from the bottom of the Phantom. DASY5 is also able to perform repeated zoom scans if more than 1 peak is found during area scan. Test results relevant for the specified standard (see chapter 1.5.) are shown in table form in chapter 3.2.

● 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 2mm steps. This measurement shows the continuity of the liquid and can – depending in the field strength- also show the liquid depth. A z-axis scan of the measurement with maximum SAR value is shown in Appendix B.

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

Frequency	Maximum Area Scan resolution (Δxarea, Δyarea)	Maximum Zoom Scan spatial resolution(Δxzoom Δyzoom)	Maximum Zoom Scan spatial resolution			Minimum zoom scan volume (x,y,z)
			Uniform Grid	Graded Grad		
			Δzzoom(n)	Δzzoom(1)	Δzzoom(n>1)	
≤2GHz	≤15mm	≤8mm	≤5mm	≤4mm	≤ 1.5*Δzzoom(n-1)	≥30mm
2-3GHz	≤12mm	≤5mm	≤5mm	≤4mm	≤ 1.5* Δzzoom(n-1)	≥30mm
3-4GHz	≤10mm	≤5mm	≤4mm	≤3mm	≤ 1.5* Δzzoom(n-1)	≥28mm
4-5GHz	≤10mm	≤4mm	≤3mm	≤2.5mm	≤ 1.5* Δzzoom(n-1)	≥25mm
5-6GHz	≤10mm	≤4mm	≤2mm	≤2mm	≤ 1.5* Δzzoom(n-1)	≥22mm

Spatial Peak SAR Evaluation

● The spatial peak SAR - value for 1 and 10 g is evaluated after the Cube measurements have been done. The bases 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).

● 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 neigh boring 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.

4.1.1. Data Storage and Evaluation

Data 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.

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, ai0, ai1, ai2

- Conversion factor ConvFi

- Diode compression point Dcpi

Device parameters: - Frequency f

- Crest factor cf

Media parameters: - Conductivity σ

- Density ρ

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 multimeter 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:

$$Vi = Ui + Ui2 \bullet cf/dcpi$$

with Vi = compensated signal of channel i (i = x, y, z)

Ui = input signal of channel i (i = x, y, z)

cf = crest factor of exciting field (DASY parameter)

dcpi = diode compression point (DASY parameter)

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

E-field probes: $Ei = (Vi / Normi \bullet ConvF)1/2$

H-field probes: $Hi = (Vi)1/2 \bullet (ai0 + ai1f + ai2f2)/f$

with Vi = compensated signal of channel i (i = x, y, z)

Normi = 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]

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

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

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

$Etot = (Ex2 + EY2 + Ez2)1/2$

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

$SAR = (Etot2 \bullet \sigma) / (\rho \bullet 1000)$

with SAR = local specific absorption rate in mW/g

Etot = total field strength in V/m

σ = conductivity in [mho/m] or [Siemens/m]

ρ = equivalent tissue density in g/cm3

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.

Ppwe = Etot2 / 3770 or Ppwe = Htot2 • 37.7

with Ppwe = equivalent power density of a plane wave in mW/cm2

Etot = total electric field strength in V/m

Htot = 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 dielectric 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

Ingredients(% of weight)	Body Tissue				
Frequency Band(MHz)	835	1750	1900	2450	750
Water	52.4	69.7	69.91	73.2	55.3
Salt(NaCl)	1.40	0.13	0.13	0.04	1.5
Sugar	45.0	0.0	0.0	0.0	47.0
HEC	1.0	0.0	0.0	0.0	0.0
Bactericide	0.1	0.0	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0
DGBE	0.0	29.71	29.96	26.7	0.0

Table 4 : Tissue Dielectric Properties

Salt: 99+% Pure Sodium Chloride; Sugar”98+% Pure Sucrose; Water: De-ionized, 16MΩ+ 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

Body Tissue-equivalent liquid measurements:

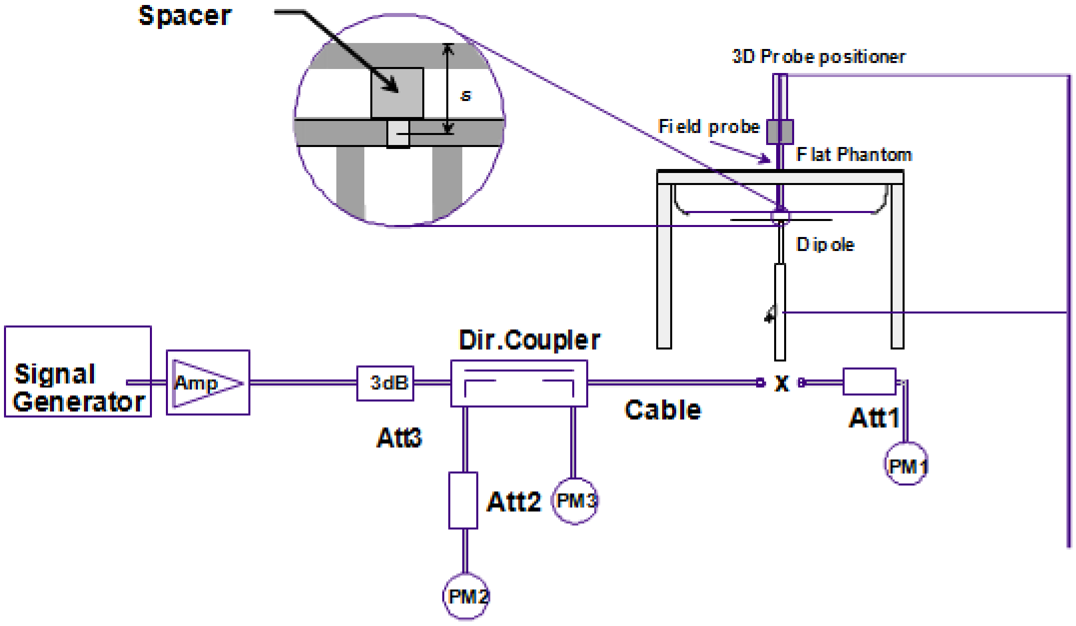
Used Target Frequency	Target Tissue		Measured Tissue		Liquid Temp	Test Date
	εr (+/-5%)	σ(S/m) (+/-5%)	εr	σ (S/m)		
835Hz Body	55.2 (52.44~57.96)	0.97 (0.92~1.02)	56.1	0.98	22°C	2016.07.18
1900MHz Body	53.3 (50.64~55.97)	1.52 (1.44~1.60)	54.2	1.50	22°C	2016.07.19
2450MHz Body	52.7 (50.07~55.34)	1.95 (1.85~2.05)	52.1	1.90	22°C	2016.07.20
750MHz Body	55.55 (52.73~58.33)	0.96 (0.91~1.01	56.8	0.94	22°C	2016.07.21
1750MHz Body	53.44 (50.77~56.11)	1.49 (1.42~1.56)	55.2	1.50	22°C	2016.07.22
ε_r= Relative permittivity, σ= Conductivity						

System checking, Body Tissue-equivalent liquid:

System Check	Target SAR (1W) (+/-10%)		Measured SAR (Normalized to 1W)		Liquid Temp.	Test Date
	1-g (W/kg)	10-g (W/kg)	1-g (W/kg)	10-g (W/kg)		
D835V2 Body	9.51 (8.6~10.5)	6.25 (5.6~7.2)	9.96	6.48	22°C	2016.07.18
D1900V2 Body	41.2 (37.1~45.3)	21.6 (19.4~23.8)	43.6	22.32	22°C	2016.07.19
D2450V2 Body	51.1 (46.0~56.2)	23.9 (21.5~26.3)	52.0	22.8	22°C	2016.07.20
D750V3 Body	8.76 (7.88~9.64)	5.75 (4.91~6.33)	9.0	5.04	22°C	2016.07.21
1750MHz Body	37.5 (33.75~41.25)	20.1 (18.09~22.11)	38.96	20.92	22°C	2016.07.22

System Checking

The manufacturer calibrates the probes annually. A system check measurement was made following the determination of the dielectric parameters of the tissue-equivalent liquid, using the dipole validation kit. A power level of 250mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom.



The system checking results (dielectric parameters and SAR values) are given in the table below.

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 (Graphic Plot(s)see Appendix A).

6. SAR MEASUREMENT VARIABILITY AND UNCERTAINTY

6.1. SAR measurement variability

Per KDB865664 D01 SAR measurement 100MHz to 6GHz v01r04, 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 measurement 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; step2) through 4) do not apply.
2) When the original highest measured SAR is ≥0.8 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 ≥1.5W/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.

6.2. SAR measurement uncertainty

Per KDB865664 D01 SAR Measurement 100MHz to 6GHz v01r03, when the highest measured 1-g SAR within a frequency band is <1.5W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2003 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.

7. Test Configuration

The DUT is tested using a CMU 200 or E5515C communications tester as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted peak power.

Test positions as described in the tables above are in accordance with the specified test standard.

GSM Test Configurations

SAR tests for GSM 850 and GSM 1900, a communication link is set up with a System Simulator (SS) by air link. Using CMU 200 or E5515C the power level is set to “5” for GSM 850, set to “0” for GSM 1900. 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 timeslots is 5.

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:

Output power of reductions:

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power,(dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

UMTS Test Configurations

3G SAR Test Reduction Procedure

In the following procedures, the mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ 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.3 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.

Output power Verification

Maximum output power is verified on the high, middle and low channels according to procedures described in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all “1’s” for WCDMA/HSDPA or by applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HSDPA, HSPA) are requied in the SAR report. All configurations that are not supported by the handset or cannot be measured due to technical or equipment limitations must be clearly identified.

Head SAR

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

Body-Worn Accessory SAR

SAR for body-worn accessory configurations is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreaing code or DPDCHn, for the highest reported body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When more than 2 DPDCHn are supported by the handset, it may be necessary to configure additional DPDCHn using FTM (Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384 kbps and 768 kbps RMC.

Handsets with Release 5 HSDPA

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

HSDPA should be configured according to the UE category of a test device.The number of HSDSCH/HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors(βc, βd), and HS-DPCCH power offset parameters (ΔACK, ΔNACK, ΔCQI) should be set according to values indicated in the Table below.

The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

Sub-set	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (note 1, note 2)	CM(dB) (note 3)	MPR(dB)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (note 4)	15/15 (note 4)	64	12/15 (note 4)	24/15	1.0	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

Note1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI}= 8 ⇔A_{hs} = β_{hs}/β_c=30/15 ⇔β_{hs}=30/15*β_c

Note2: CM=1 for β_c/β_d =12/15, β_{hs}/β_c=24/15.

Note3: For subtest 2 the $\beta_c\beta_d$ ratio of 12/15 for the TFC during the measurement period(TF1,TF0) is achieved by setting the signaled gain factors for the reference TFC (TFC1,TF1) to β_c=11/15 and β_d=15/15.

HSUPA Test Configuration

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

Due to inner loop power control requirements in HSPA, a communication test set is required for output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA are configured according to the β values indicated in Table 2 and other applicable proceduresdescribed in the ‘WCDMA Handset’ and ‘Release 5 HSDPA Data Devices’ sections of this document

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

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

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

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

HSPA, HSPA+ and DC-HSDPA Test Configuration

measurement is required for HSPA, HSPA+ or DC-HSDPA, a KDB inquiry is required to confirm that the wireless mode configurations in the test setup have remained stable throughout the SAR measurements.35 Without prior KDB confirmation to determine the SAR results are acceptable, a PBA is required for TCB approval. SAR test exclusion for HSPA, HSPA+ and DC-HSDPA is determined according to the following:

1) The HSPA procedures are applied to configure 3GPP Rel. 6 HSPA devices in the required sub-test mode(s) to determine SAR test exclusion.

2) 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.36 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.

3) 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 secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.

4) Regardless of whether a PBA is required, the following information must be verified and included in the SAR report for devices supporting HSPA, HSPA+ or DC-HSDPA: a) The output power measurement results and applicable release version(s) of 3GPP TS 34.121.

i) Power measurement difficulties due to test equipment setup or availability must be resolved between the grantee and its test lab.

b) The power measurement results are in agreement with the individual device implementation and specifications. When Enhanced MPR (E-MPR) applies, the normal MPR targets may be modified according to the Cubic Metric (CM) measured by the device, which must be taken into consideration.

c) The UE category, operating parameters, such as the β and Δ values used to configure the device for testing, power setback procedures described in 3GGPP TS 34.121 for the power measurements, and HSPA/HSPA+ channel conditions (active and stable) for the entire duration of the measurement according to the required E-TFCI and AG index values.

5) When SAR measurement is required, the test configurations, procedures and power measurement results must be clearly described to confirm that the required test parameters are used, including
E-TFCI and AG index stability and output power conditions.

HS-DSCH category	Maximum number of HS-DSCH codes received	Minimum inter-TTI interval	Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI NOTE 1	Total number of soft channel bits	Supported modulations without MIMO operation or dual cell operation	Supported modulations with MIMO operation and without dual cell operation	Supported modulations with dual cell operation
Category 1	5	3	7298	19200	QPSK, 16QAM	Not applicable (MIMO not supported)	Not applicable (dual cell operation not supported)
Category 2	5	3	7298	28800			
Category 3	5	2	7298	28800			
Category 4	5	2	7298	38400			
Category 5	5	1	7298	57600			
Category 6	5	1	7298	67200			
Category 7	10	1	14411	115200			
Category 8	10	1	14411	134400			
Category 9	15	1	20251	172800			
Category 10	15	1	27952	172800			
Category 11	5	2	3630	14400	QPSK		
Category 12	5	1	3630	28800			
Category 13	15	1	35280	259200	QPSK, 16QAM, 64QAM		
Category 14	15	1	42192	259200			
Category 15	15	1	23370	345600	QPSK, 16QAM		
Category 16	15	1	27952	345600			
Category 17 NOTE 2	15	1	35280	259200	QPSK, 16QAM, 64QAM	-	
			23370	345600	-	QPSK, 16QAM	
Category 18 NOTE 3	15	1	42192	259200	QPSK, 16QAM, 64QAM	-	
			27952	345600	-	QPSK, 16QAM	
Category 19	15	1	35280	518400	QPSK, 16QAM, 64QAM		
Category 20	15	1	42192	518400			
Category 21	15	1	23370	345600	-	-	QPSK, 16QAM
Category 22	15	1	27952	345600			
Category 23	15	1	35280	518400			QPSK, 16QAM, 64QAM
Category 24	15	1	42192	518400			

LTE Test Configuration

SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices v02r05. The CMW500 WideBand 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:

Maximun Power Reduction(MRP) for Power Class 3

<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth(N_{RB})</th><th rowspan="2">MPR(dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>＞5</td><td>＞4</td><td>＞8</td><td>＞12</td><td>＞16</td><td>＞18</td><td>⩽1</td></tr>
<tr><td>16 QAM</td><td>⩽5</td><td>⩽4</td><td>⩽8</td><td>⩽12</td><td>⩽16</td><td>⩽18</td><td>⩽1</td></tr>
<tr><td>16 QAM</td><td>＞5</td><td>＞4</td><td>＞8</td><td>＞12</td><td>＞16</td><td>＞18</td><td>⩽2</td></tr>
</table>

Configuration of special subframe (lengths of DwPTS/GP/UpPTS)

<table>
<tr><th rowspan="3">Special subframe configuration</th><th colspan="3">Normal cyclic prefix in downlink</th><th colspan="3">Extended cyclic prefix in downlink</th></tr>
<tr><th rowspan="2">DwPTS</th><th colspan="2">UpPTS</th><th rowspan="2">DwPTS</th><th colspan="2">UpPTS</th></tr>
<tr><th>Normal cyclic prefix in uplink</th><th>Extended cyclic prefix in uplink</th><th>Normal cyclic prefix in uplink</th><th>Extended cyclic prefix in uplink</th></tr>
<tr><td>0</td><td>$6592 \cdot T_s$</td><td rowspan="5">$2192 \cdot T_s$</td><td rowspan="5">$2560 \cdot T_s$</td><td>$7680 \cdot T_s$</td><td rowspan="4">$2192 \cdot T_s$</td><td rowspan="4">$2560 \cdot T_s$</td></tr>
<tr><td>1</td><td>$19760 \cdot T_s$</td><td>$20480 \cdot T_s$</td></tr>
<tr><td>2</td><td>$21952 \cdot T_s$</td><td>$23040 \cdot T_s$</td></tr>
<tr><td>3</td><td>$24144 \cdot T_s$</td><td>$25600 \cdot T_s$</td></tr>
<tr><td>4</td><td>$26336 \cdot T_s$</td><td>$7680 \cdot T_s$</td><td rowspan="4">$4384 \cdot T_s$</td><td rowspan="4">$5120 \cdot T_s$</td></tr>
<tr><td>5</td><td>$6592 \cdot T_s$</td><td rowspan="5">$4384 \cdot T_s$</td><td rowspan="5">$5120 \cdot T_s$</td><td>$20480 \cdot T_s$</td></tr>
<tr><td>6</td><td>$19760 \cdot T_s$</td><td>$23040 \cdot T_s$</td></tr>
<tr><td>7</td><td>$21952 \cdot T_s$</td><td>$12800 \cdot T_s$</td></tr>
<tr><td>8</td><td>$24144 \cdot T_s$</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>9</td><td>$13168 \cdot T_s$</td><td>-</td><td>-</td><td>-</td></tr>
</table>

Uplink-downlink configurations

Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

Calculated Duty Cycle = Extended cyclic prefix in uplink x (Ts) x # of S + # of U

Example for Calculated Duty Cycle for Uplink-Downlink Configuration 0:

Calculated Duty Cycle = 5120 x [1/(15000 x 2048)] x 2 + 6 ms = 63.33%

Where Ts = 1/(15000 x 2048) seconds

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 ≤ 0.8W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1RB 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.

WIFI Test Configurations

For WLAN SAR testing, WLAN engineering testing software installed on the DUT can provide continuous transmitting RF signal. The Tx power is set according to tune up procedure for 802.11 b mode by software. This RF signal utilized in SAR measurement has almost 100% duty cycle and its crest factor is 1.

For the 802.11b/g/n SAR tests, 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.

8. TUNE-UP LIMIT

GSM/GPRS850 (GMSK) :

1TXslot: 34dBm [-2.0dB~~+1.0dB]

2Txslots: 31dBm [-2.0dB~~+1.0dB]

3Txslots: 29dBm [-2.0dB~~+1.0dB]

4TXslots:27dBm [-2.0dB~~+1.0dB]

EDGE850 (8PSK) :

1TXslot: 27dBm [-2.0dB~~+1.0dB]

2TXslots: 24dBm [-2.0dB~~+1.0dB]

3TXslots:23dBm [-2.0dB~~+1.0dB]

4TXslots:21dBm [-2.0dB~~+1.0dB]

PCS/GPRS 1900 (GMSK) :

1TXslot: 30dBm [-2.0dB~~+1.0dB]

2TXslots:28dBm [-2.0dB~~+1.0dB]

3TXslots: 26dBm [-2.0dB~~+1.0dB]

4Txslots: 24dBm [-2.0dB~~+1.0dB]

EDGE 1900 (8PSK) :

1TXslot: 26dBm [-2.0dB~~+1.0dB]

2TXslots:24dBm [-2.0dB~~+1.0dB]

3TXslots:22dBm [-2.0dB~~+1.0dB]

4TXslots: 19dBm [-2.0dB~~+1.0dB]

The UMTS Band II power adjust procedure

WCDMA： 23dBm [-3dB~~+1dB]

HSDPA：

HSDPA Subtest 1： 22dBm [-2dB~~+1.0dB]

HSDPA Subtest 2： 21dBm [-2dB~~+1.0dB]

HSDPA Subtest 3： 21dBm [-2dB~~+1.0dB]

HSDPA Subtest 4： 21dBm [-2dB~~+1.0dB]

HSUPA：

HSUPA Subtest 1： 21dBm [-2.0dB~~+1.0dB]

HSUPA Subtest 2： 21dBm [-2.0dB~~+1.0dB]

HSUPA Subtest 3： 20dBm [-2.0dB~~+1.0dB]

HSUPA Subtest 4： 21dBm [-2.0dB~~+1.0dB]

HSUPA Subtest 5： 22dBm [-2.0dB~~+1.0dB]

The UMTS Band IV power adjust procedure

WCDMA： 22dBm [-3dB~~+1dB]

HSDPA：

HSDPA Subtest 1： 22dBm [-2dB~~+1.0dB]

HSDPA Subtest 2： 21dBm [-2dB~~+1.0dB]

HSDPA Subtest 3： 21dBm [-3.7dB~~+1.0dB]

HSDPA Subtest 4： 21dBm [-3.7dB~~+1.0dB]

HSUPA：

HSUPA Subtest 1： 21dBm [-2.0dB~~+1.0dB]

HSUPA Subtest 2： 20dBm [-2.0dB~~+1.0dB]

HSUPA Subtest 3： 20dBm [-2.0dB~~+1.0dB]

HSUPA Subtest 4： 20dBm [-2.0dB~~+1.0dB]

HSUPA Subtest 5： 21dBm [-2.0dB~~+1.0dB]

The UMTS Band V power adjust procedure

WCDMA： 23dBm [-3dB~~+1dB]

HSDPA：

HSDPA Subtest 1： 23dBm [-3.7dB~~+1.0dB]

HSDPA Subtest 2： 22dBm [-3.7dB~~+1.0dB]

HSDPA Subtest 3：22dBm [-3.7dB~~+1.0dB]

HSDPA Subtest 4： 21dBm [-3.7dB~~+1.0dB]

HSUPA：

HSUPA Subtest 1： 22dBm [-2dB~~+1.0dB]

HSUPA Subtest 2： 20dBm [-2dB~~+1.0dB]

HSUPA Subtest 3： 21dBm [-2dB~~+1.0dB]

HSUPA Subtest 4： 21dBm [-2dB~~+1.0dB]

HSUPA Subtest 5： 22dBm [-2dB~~+1.0dB]

The LTE Band 2 power adjust procedure

1.4 MHz QPSK/16QAM: 21dBm [-2.0dB~~+2.0dB]

3 MHz QPSK/16QAM: 21dBm [-2.0dB~~+2.0dB]

5 MHz QPSK/16QAM: 21dBm [-2.0dB~~+2.0dB]

10 MHz QPSK/16QAM:22dBm [-2.0dB~~+2.0dB]

15 MHz QPSK/16QAM: 21dBm [-2.0dB~~+2.0dB]

20 MHz QPSK/16QAM: 22dBm [-2.0dB~~+2.0dB]

The LTE Band 4 power adjust procedure

1.4 MHz QPSK/16QAM: 21dBm [-2.0dB~~+2.0dB]

3 MHz QPSK/16QAM: 21dBm [-2.0dB~~+2.0dB]

5 MHz QPSK/16QAM: 21dBm [-2.0dB~~+2.0dB]

10 MHz QPSK/16QAM: 21dBm [-2.0dB~~+2.0dB]

15 MHz QPSK/16QAM: 21dBm [-2.0dB~~+2.0dB]

20 MHz QPSK/16QAM: 21dBm [-2.0dB~~+2.0dB]

The LTE Band 12 power adjust procedure

1.4 MHz QPSK/16QAM: 21dBm [-2.0dB~~+2.0dB]

3 MHz QPSK/16QAM: 22dBm [-2.0dB~~+2.0dB]

5 MHz QPSK/16QAM: 22dBm [-2.0dB~~+2.0dB]

10 MHz QPSK/16QAM: 23dBm [-2.0dB~~+2.0dB]

The Wi-Fi RF test procedure

Average Power：(Antenna 1#)

11b： 17dBm [-1dB~~+1.0dB]

11g： 12dBm [-2dB~~+1.0dB]

11n： 12dBm [-4dB~~+1.0dB]

Average Power：(Antenna 2#)

11b： 15dBm [-1dB~~+1.0dB]

11g： 13dBm [-3dB~~+1.0dB]

11n： 13dBm [-5dB~~+1.0dB]

Average Power：(Antenna MIMO)

11b： 19dBm [-1dB~~+1.0dB]

11g： 16dBm [-3dB~~+1.0dB]

11n： 16dBm [-5dB~~+1.0dB]

9. MEASUREMENT RESULTS

Result: Passed

Date of testing	:	2016.07.18~2016.07.22
Ambient temperature	:	20℃~22℃
Relative humidity	:	50~68%

9.1. Conducted Power

For the measurements a Rohde & Schwarz Radio Communication Tester CMU 200 was used. SAR drift measured at the same position in liquid before and after each SAR test.

Note: CMU200 measures GSM peak and average output power for active timeslots. For SAR the time based average power is relevant. The difference in between depends on the duty cycle of the TDMA signal:

No. of Timeslots	1	2	3	4
Duty Cycle	1:8.3	1:4.1	1:2.77	1:2.08
Time based avg. power compared to slotted avg. power	-9.19dB	-6.13dB	-4.42dB	-3.18dB

The signalling modes differ as follows:

Mode	Coding scheme	Modulation
GPRS	CS1 to CS4	GMSK
EDGE	MCS1 to MCS4	GMSK
EDGE	MCS5 to MCS9	8PSK

Apart from modulation change (GMSK/8PSK) coding schemes differ in code rate without influence on the RF signal. Therefore one coding scheme per mode was selected for conducted power measurements.

GSM Conducted Power Measurement Results

Band: GSM850	**Burst Average Power (dBm)**			**Frame Average Power (dBm)**		
Channel	**128**	**190**	**251**	**128**	**190**	**251**
Frequency (MHz)	**824.2**	**836.6**	**848.8**	**824.2**	**836.6**	**848.8**
GPRS/EDGE (GMSK, 1 Tx slot)	34.09	33.83	34.04	24.9	24.64	24.85
GPRS/EDGE (GMSK, 2 Tx slots)	**31.60**	**31.56**	**31.83**	**25.47**	**25.43**	**25.7**
GPRS/EDGE (GMSK, 3 Tx slots)	29.57	29.46	29.59	25.15	25.04	25.17
GPRS/EDGE (GMSK, 4 Tx slots)	27.98	27.88	27.77	24.8	24.7	24.59
EDGE (8PSK, 1 Tx slot)	27.13	27.06	27.11	17.94	17.87	17.92
EDGE (8PSK, 2 Tx slots)	24.89	24.78	24.91	18.76	18.65	18.78
EDGE (8PSK, 3 Tx slots)	23.04	23.01	23.02	18.62	18.59	18.6
EDGE (8PSK, 4 Tx slots)	20.90	20.88	21.05	17.72	17.7	17.87

Remark:

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 timeslots.
3) Per KDB941225 D01v03, the bolded GPRS 2 Tx mode was selected as the primary mode for SAR testing according to the highest frame- averaged output power table.

Band: GSM1900	Burst Average Power (dBm)			Frame Average Power (dBm)		
Channel	512	661	810	512	661	810
Frequency (MHz)	1850.2	1880	1909.8	1850.2	1880	1909.8
GPRS/EDGE (GMSK, 1 Tx slot)	30.51	30.29	29.76	21.32	21.1	20.57
GPRS/EDGE (GMSK, 2 Tx slots)	**28.55**	**28.02**	**28.07**	**22.42**	**21.89**	**21.94**
GPRS/EDGE (GMSK, 3 Tx slots)	26.22	25.94	25.37	21.8	21.52	20.95
GPRS/EDGE (GMSK, 4 Tx slots)	24.31	24.05	23.31	21.13	20.87	20.13
EGPRS (8PSK, 1 Tx slot)	26.52	26.11	25.28	17.33	16.92	16.09
EGPRS (8PSK, 2 Tx slots)	24.23	23.83	23.03	18.1	17.7	16.9
EGPRS (8PSK, 3 Tx slots)	22.09	21.72	20.92	17.67	17.3	16.5
EGPRS (8PSK, 4 Tx slots)	19.84	19.57	18.81	16.66	16.39	15.63

Remark:

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 timeslots.

Per KDB941225 D01v03, the bolded GPRS 2 Tx mode was selected as the primary mode for SAR testing according to the highest frame- averaged output power table.

UMTS Conducted Power Measurement Results

UMTS Band II		Conducted Power (dBm)		
		9263CH	9400CH	9538CH
WCDMA	12.2kbps RMC	**23.03**	**23.18**	**22.56**
	64kbps RMC	22.81	23.09	22.52
	144kbps RMC	22.78	23.06	22.56
	384kbps RMC	22.76	23.10	22.52
HSDPA	Subtest 1	21.86	22.41	21.97
	Subtest 2	21.26	21.72	21.48
	Subtest 3	21.36	21.86	21.41
	Subtest 4	21.52	21.90	21.22
HSUPA	Subtest 1	21.47	21.90	21.57
	Subtest 2	20.83	21.35	20.96
	Subtest 3	20.53	20.93	20.56
	Subtest 4	21.31	21.42	21.14
	Subtest 5	22.01	22.08	21.64

Remark:

1) The conducted power of UMTS Band II is measured with RMS detector

2)Per KDB 941225 D01v03, When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤0.25 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 adjusted SAR is ≤ 1.2W/kg, SAR measurement is not required for the secondary mode.

UMTS Band IV		Conducted Power (dBm)		
		1312CH	1413CH	1513CH
WCDMA	12.2kbps RMC	**21.98**	**22.48**	**22.70**
	64kbps RMC	21.91	22.43	22.65
	144kbps RMC	21.93	22.35	22.70
	384kbps RMC	21.96	22.47	22.70
HSDPA	Subtest 1	21.03	21.89	22.18
	Subtest 2	20.89	21.33	21.54
	Subtest 3	20.92	21.37	21.56
	Subtest 4	20.83	21.12	21.67
HSUPA	Subtest 1	20.50	21.16	21.82
	Subtest 2	19.92	20.74	20.80
	Subtest 3	19.59	20.41	20.41
	Subtest 4	20.68	20.77	20.95
	Subtest 5	20.89	21.35	21.53

Remark:

1) The conducted power of UMTS Band V is measured with RMS detector
2) Per KDB 941225 D01v03, When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤0.25 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 adjusted SAR is ≤ 1.2W/kg, SAR measurement is not required for the secondary mode.

UMTS Band V		Conducted Power (dBm)		
		4132CH	4182CH	4233CH
WCDMA	12.2kbps RMC	**23.64**	**23.45**	**23.55**
	64kbps RMC	23.57	23.40	23.50
	144kbps RMC	23.59	23.32	23.55
	384kbps RMC	23.62	23.44	23.55
HSDPA	Subtest 1	23.62	23.37	23.50
	Subtest 2	22.84	22.61	22.68
	Subtest 3	22.26	22.0	22.11
	Subtest 4	21.95	21.73	21.82
HSUPA	Subtest 1	22.67	22.42	22.50
	Subtest 2	20.59	20.36	20.45
	Subtest 3	21.52	21.29	21.40
	Subtest 4	21.31	21.06	21.20
	Subtest 5	22.76	22.55	22.62

Remark:

3) The conducted power of UMTS Band V is measured with RMS detector
4) Per KDB 941225 D01v03, When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤0.25 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 adjusted SAR is ≤ 1.2W/kg, SAR measurement is not required for the secondary mode.

Conducted power measurements of LTE Band 2

Bandwidth	Modulation	RB size	RB offset	Channel 18607	Channel 18900	Channel 19193
1.4MHz	QPSK	1	0	22.63	22.72	22.55
		1	3	22.75	22.87	22.84
		1	5	22.64	22.72	22.55
		3	0	22.60	22.57	22.45
		3	2	22.59	22.62	22.75
		3	3	22.59	22.57	22.40
		6	0	21.51	21.62	21.39
	16QAM	1	0	21.75	21.73	21.71
		1	3	21.65	21.63	21.61
		1	5	21.77	21.50	21.90
		3	0	21.62	21.76	21.18
		3	2	21.74	21.70	21.97
		3	3	21.73	21.54	21.81
		6	0	20.09	20.53	20.27

Bandwidth	Modulation	RB size	RB offset	Channel 18615	Channel 18900	Channel 19185
3MHz	QPSK	1	0	22.62	22.61	22.26
		1	7	22.76	22.71	22.55
		1	14	22.64	22.86	22.53
		8	0	21.57	21.70	21.40
		8	4	21.64	21.67	21.64
		8	7	21.60	21.69	21.62
		15	0	21.48	21.66	21.28
	16QAM	1	0	21.88	22.13	21.85
		1	7	21.62	21.98	21.51
		1	14	21.78	22.15	21.86
		8	0	20.45	20.72	20.55
		8	4	20.47	20.71	20.39
		8	7	20.39	20.70	20.49
		15	0	20.50	20.68	20.23

Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel
				18625	18900	19175
5MHz	QPSK	1	0	22.48	22.70	22.49
		1	12	22.56	22.70	22.33
		1	24	22.72	22.79	22.44
		12	0	21.50	21.66	21.29
		12	6	21.65	21.63	21.36
		12	13	21.61	21.75	21.43
		25	0	21.66	21.66	21.46
	16QAM	1	0	21.92	22.06	21.66
		1	13	22.01	22.09	22.15
		1	24	22.21	22.26	22.24
		12	0	20.68	20.84	20.59
		12	6	20.82	20.81	20.75
		12	13	20.78	20.91	20.59
		25	0	20.72	20.73	20.68

Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel
				18650	18900	19150
10MHz	QPSK	1	0	22.43	22.69	22.86
		1	24	22.75	22.90	23.13
		1	49	22.45	22.57	22.72
		25	0	21.60	21.62	21.27
		25	12	21.56	21.65	21.20
		25	25	21.58	21.62	21.21
		50	0	21.58	21.55	21.17
	16QAM	1	0	22.24	21.85	22.23
		1	24	22.37	22.22	22.50
		1	49	21.74	21.90	21.55
		25	0	20.62	20.63	20.33
		25	12	20.62	20.76	20.45
		25	25	20.65	20.62	20.45
		50	0	20.77	20.68	20.43

Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel
				18675	18900	19125
15MHz	QPSK	1	0	22.45	22.54	22.62
		1	37	22.69	22.80	22.95
		1	74	22.46	22.47	22.73
		37	0	21.51	21.52	21.19
		37	18	21.46	21.62	21.33
		37	38	21.39	21.52	21.23
		75	0	21.45	21.43	21.02
	16QAM	1	0	22.25	21.81	21.94
		1	37	22.43	22.49	22.33
		1	74	21.95	21.96	21.88
		37	0	20.64	20.47	20.37
		37	18	20.57	20.47	20.43
		37	38	20.46	20.43	20.45
		75	0	20.50	20.58	20.51

Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel
				18700	18900	19100
20MHz	QPSK	1	0	22.57	22.32	22.20
		1	49	**22.71**	**23.15**	**22.70**
		1	99	22.25	22.30	22.78
		50	0	21.58	21.56	21.55
		50	25	21.44	21.60	21.22
		50	50	21.41	21.44	21.17
		100	0	21.43	21.51	21.11
	16QAM	1	0	21.21	21.26	21.18
		1	49	21.32	21.55	21.24
		1	99	20.69	20.73	20.55
		50	0	20.60	20.50	20.18
		50	25	20.59	20.65	20.40
		50	50	20.31	20.36	20.34
		100	0	20.48	20.54	20.38

Conducted power measurements of LTE Band 4

Bandwidth	Modulation	RB size	RB offset	Channel 19957	Channel 20175	Channel 20393
1.4MHz	QPSK	1	0	22.06	22.45	22.53
		1	3	22.29	22.46	22.58
		1	5	22.19	22.29	22.52
		3	0	22.13	22.33	22.49
		3	2	22.16	22.42	22.63
		3	3	22.15	22.37	22.57
		6	0	21.95	21.41	21.58
	16QAM	1	0	21.06	21.47	21.39
		1	3	21.05	21.57	21.49
		1	5	21.04	21.37	21.49
		3	0	21.28	21.56	21.66
		3	2	21.43	21.62	21.74
		3	3	21.99	21.54	21.81
		6	0	20.84	20.66	20.47

Bandwidth	Modulation	RB size	RB offset	Channel 19965	Channel 20175	Channel 20385
3MHz	QPSK	1	0	22.27	22.41	22.34
		1	7	22.26	22.42	22.30
		1	14	22.47	22.55	22.69
		8	0	21.32	21.42	21.37
		8	4	21.48	21.55	21.50
		8	7	21.38	21.59	21.42
		15	0	21.29	21.33	21.43
	16QAM	1	0	21.65	21.73	22.02
		1	7	21.57	21.72	21.75
		1	14	21.92	22.05	21.98
		8	0	20.45	20.37	20.55
		8	4	20.28	20.53	20.57
		8	7	20.25	20.46	20.54
		15	0	20.36	20.40	20.46

Bandwidth	Modulation	RB size	RB offset	Channel 19975	Channel 20175	Channel 20375
5MHz	QPSK	1	0	21.98	22.10	22.32
		1	12	22.06	22.36	22.39
		1	24	22.28	22.60	22.67
		12	0	21.13	21.37	21.49
		12	6	21.11	21.51	21.50
		12	13	21.14	21.53	21.54
		25	0	21.05	21.36	21.48
	16QAM	1	0	21.18	21.46	21.54
		1	13	21.37	21.74	21.46
		1	24	21.44	21.92	21.54
		12	0	20.36	20.50	20.68
		12	6	20.35	20.65	20.68
		12	13	20.30	20.67	20.72
		25	0	20.28	20.46	20.68

Bandwidth	Modulation	RB size	RB offset	Channel 20000	Channel 20175	Channel 20350
10MHz	QPSK	1	0	22.22	22.32	22.63
		1	24	22.14	22.59	22.42
		1	49	22.13	22.58	22.52
		25	0	21.03	21.37	21.51
		25	12	21.06	21.48	21.39
		25	25	21.03	21.52	21.43
		50	0	21.37	21.44	21.40
	16QAM	1	0	22.37	22.30	22.40
		1	24	22.01	22.07	22.09
		1	49	21.90	22.29	22.07
		25	0	20.21	20.46	20.65
		25	12	20.31	20.56	20.62
		25	25	20.37	20.59	20.45
		50	0	20.47	20.51	20.55

Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel
				20025	20175	20325
15MHz	QPSK	1	0	22.29	22.34	22.68
		1	37	22.40	22.74	22.38
		1	74	22.34	22.69	22.44
		37	0	21.27	21.37	21.64
		37	18	21.29	21.54	21.46
		37	38	21.20	21.58	21.39
		75	0	21.06	21.39	21.41
	16QAM	1	0	21.91	21.89	22.35
		1	37	21.92	22.09	22.03
		1	74	22.16	22.43	22.12
		37	0	20.48	20.37	20.68
		37	18	20.54	20.54	20.50
		37	38	20.54	20.57	20.34
		75	0	20.39	20.48	20.57

Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel
				20050	20175	20300
20MHz	QPSK	1	0	22.25	22.28	22.58
		1	49	**22.78**	**22.85**	**22.98**
		1	99	22.84	22.72	22.52
		50	0	21.22	21.38	21.59
		50	25	21.12	21.53	21.53
		50	50	21.13	21.55	21.34
		100	0	21.23	21.44	21.53
	16QAM	1	0	21.77	21.69	21.41
		1	49	21.31	21.07	21.47
		1	99	21.23	21.33	21.69
		50	0	20.40	20.41	20.71
		50	25	20.43	20.57	20.62
		50	50	20.33	20.58	20.26
		100	0	20.23	20.41	20.57

Conducted power measurements of LTE Band 12

Bandwidth	Modulation	RB size	RB offset	Channel 23017	Channel 23095	Channel 23173
1.4MHz	QPSK	1	0	22.68	22.77	22.60
		1	3	22.65	22.85	22.66
		1	5	22.59	22.78	22.59
		3	0	22.70	22.89	22.51
		3	2	22.71	22.97	22.56
		3	3	22.59	22.81	22.61
		6	0	21.62	21.79	21.44
	16QAM	1	0	21.79	22.09	21.84
		1	3	21.79	22.07	21.87
		1	5	21.63	22.07	21.83
		3	0	21.96	21.84	21.57
		3	2	21.85	22.04	21.67
		3	3	21.81	21.99	21.52
		6	0	20.78	20.76	20.48

Bandwidth	Modulation	RB size	RB offset	Channel 23025	Channel 23095	Channel 23165
3MHz	QPSK	1	0	22.63	22.80	22.68
		1	7	22.53	22.96	22.78
		1	14	22.62	22.83	23.06
		8	0	21.71	21.90	21.67
		8	4	21.67	21.90	21.79
		8	7	21.74	21.73	21.79
		15	0	21.69	21.86	21.68
	16QAM	1	0	22.10	21.93	21.86
		1	7	21.97	22.01	22.03
		1	14	21.85	22.22	22.23
		8	0	20.73	20.53	20.65
		8	4	20.79	20.57	20.68
		8	7	20.84	20.45	20.67
		15	0	20.94	20.77	20.84

Bandwidth	Modulation	RB size	RB offset	Channel 23035	Channel 23095	Channel 23155
5MHz	QPSK	1	0	22.68	22.65	22.68
		1	12	22.43	22.90	22.78
		1	24	22.89	22.82	23.16
		12	0	21.65	21.80	21.64
		12	6	21.67	21.88	21.54
		12	13	21.74	21.79	21.66
		25	0	21.63	21.78	21.62
	16QAM	1	0	21.77	21.92	21.84
		1	12	21.87	22.07	21.82
		1	24	22.24	21.95	21.98
		12	0	20.85	20.96	20.65
		12	6	20.79	20.99	20.74
		12	13	20.92	20.93	20.75
		25	0	20.74	20.83	20.64

Bandwidth	Modulation	RB size	RB offset	Channel 23060	Channel 23095	Channel 23130
10MHz	QPSK	1	0	22.46	22.42	22.75
		1	24	23.91	24.30	23.95
		1	49	**23.88**	**23.49**	**23.40**
		25	0	21.57	21.76	21.85
		25	12	21.74	21.86	21.60
		25	25	21.94	21.74	21.57
		50	0	21.63	21.78	21.83
	16QAM	1	0	22.48	22.37	22.29
		1	24	22.46	22.87	22.51
		1	49	22.54	22.82	22.98
		25	0	20.63	20.95	20.90
		25	12	20.79	21.05	20.70
		25	25	20.85	20.89	20.61
		50	0	20.88	20.92	20.84

WLAN 2.4GHz Band Conducted Power (Antenna 1#)

Wi-Fi 2450MHz	Channel	Average Power (dBm) for Data Rates (Mbps)								Sar test (Yes or NO)
		1	2	5.5	11	/	/	/	/	
802.11b 2.4G(DSSS)	1(2412)	**16.97**	16.85	16.8	16.69	/	/	/	/	Yes Initial Test Configuration
	6(2437)	**16.90**	16.16	15.69	16.24	/	/	/	/	
	11(2462)	**17.15**	17.05	16.51	17.05	/	/	/	/	
802.11g 2.4G(OFDM)	Channel	6	9	12	18	24	36	48	54	Yes Subsequent Test Configuration
	1(2412)	12.03	11.28	11.33	11.25	11.17	11.05	10.83	10.71	
	6(2437)	12.34	12.15	12.12	12.18	12.23	11.9	11.62	11.47	
	11(2462)	12.61	12.44	12.39	12.19	12.24	12.14	11.76	11.62	
802.11n-HT20 2.4G(OFDM)	Channel	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	Yes Subsequent Test Configuration
	1(2412)	12.50	11.77	11.74	11.68	11.55	11.33	11.21	10.85	
	6(2437)	12.54	12.42	12.43	12.27	12.17	11.81	11.72	11.53	
	11(2462)	12.58	12.37	12.14	12.26	12.13	11.8	11.58	11.21	
802.11n-HT40 2.4G(OFDM)	Channel	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	Yes Subsequent Test Configuration
	3(2422)	11.01	10.96	10.53	10.34	9.5	8.95	8.6	8.35	
	6(2437)	11.24	11.2	10.93	10.78	9.94	9.47	9.15	8.87	
	9(2452)	11.32	11.33	11.09	10.5	9.73	9.18	8.89	8.75	

WLAN 2.4GHz Band Conducted Power (Antenna 2#)

Wi-Fi 2450MHz	Channel	Average Power (dBm) for Data Rates (Mbps)								Sar test (Yes or NO)
		1	2	5.5	11	/	/	/	/	
802.11b 2.4G(DSSS)	1(2412)	**14.72**	14.6	14.55	14.44	/	/	/	/	Yes Initial Test Configuration
	6(2437)	**15.41**	14.67	14.2	14.75	/	/	/	/	
	11(2462)	**15.86**	16.16	15.22	15.76	/	/	/	/	
802.11g 2.4G(OFDM)	Channel	6	9	12	18	24	36	48	54	Yes Subsequent Test Configuration
	1(2412)	12.30	11.55	11.6	11.52	11.44	11.32	11.1	10.98	
	6(2437)	13.06	12.87	12.84	12.9	12.95	12.62	12.34	12.19	
	11(2462)	13.45	13.28	13.23	13.03	13.08	12.98	12.6	12.46	
802.11n-HT20 2.4G(OFDM)	Channel	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	Yes Subsequent Test Configuration
	1(2412)	12.58	11.85	11.82	11.76	11.63	11.41	11.29	10.93	
	6(2437)	12.98	12.86	12.87	12.71	12.61	12.25	12.16	11.97	
	11(2462)	13.45	13.24	13.01	13.13	13	12.67	12.45	12.08	
802.11n-HT40 2.4G(OFDM)	Channel	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	Yes Subsequent Test Configuration
	3(2422)	11.35	11.3	10.87	10.68	9.84	9.29	8.94	8.69	
	6(2437)	11.72	11.68	11.41	11.26	10.42	9.95	9.63	9.35	
	9(2452)	12.06	12.07	11.83	11.24	10.47	9.92	9.63	9.49	

WLAN 2.4GHz Band Conducted Power (Antenna MIMO)

Wi-Fi 2450MHz	Channel	Average Power (dBm) for Data Rates (Mbps)								Sar test (Yes or NO)
		1	2	5.5	11	/	/	/	/	
802.11b 2.4G(DSSS)	1(2412)	**18.9**	18.78	18.73	18.62	/	/	/	/	Yes Initial Test Configuration
	6(2437)	**19.22**	18.48	18.01	18.56	/	/	/	/	
	11(2462)	**19.56**	19.26	18.92	19.46	/	/	/	/	
802.11g 2.4G(OFDM)	Channel	6	9	12	18	24	36	48	54	Yes Subsequent Test Configuration
	1(2412)	15.17	14.42	14.47	14.39	14.31	14.19	13.97	13.85	
	6(2437)	15.72	15.53	15.5	15.56	15.61	15.28	15	14.85	
	11(2462)	16.06	15.89	15.84	15.64	15.69	15.59	15.21	15.07	
802.11n-HT20 2.4G(OFDM)	Channel	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	Yes Subsequent Test Configuration
	1(2412)	15.55	14.82	14.79	14.73	14.6	14.38	14.26	13.9	
	6(2437)	15.77	15.65	15.66	15.5	15.4	15.04	14.95	14.76	
	11(2462)	16.05	15.84	15.61	15.73	15.6	15.27	15.05	14.68	
802.11n-HT40 2.4G(OFDM)	Channel	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	Yes Subsequent Test Configuration
	3(2422)	14.19	14.14	13.71	13.52	12.68	12.13	11.78	11.53	
	6(2437)	14.49	14.45	14.18	14.03	13.19	12.72	12.4	12.12	
	9(2452)	14.71	14.72	14.48	13.89	13.12	12.57	12.28	12.14	

Remark:

Output Power Measurement Considerations for Wi-Fi 2.4 GHz band

1. 2.4 GHz 802.11b DSSS:

- Output power measurement is not required:

o When SAR Test Exclusion according to KDB 447498 D01 applies.

o When other power measurement reduction applies.

- Otherwise, output power measurement is required on:
o Channels 1, 6, and 11, when the output power specified for other channels is no higher than the abovementioned channels.
o The closest adjacent channels to the aforementioned channels, when the output power specified for these adjacent channels is higher.
- For ease of identification, 802.11b DSSS is identified as the Initial Test Configuration for the 2.4 GHz band.
2. 2.4 GHz 802.11g/n OFDM
- Output power measurement is not required:
o When SAR Test Exclusion according to KDB 447498 D01 applies.
o When SAR Test Exclusion procedures for 2.4 GHz 802.11g/n OFDM applies, according to the SAR measurement results from 802.11b DSSS; see Section 11 of the report for details.
- Otherwise, output power measurement is required for 2.4 GHz 802.11g/n OFDM, with the following considerations:
o If 40 MHz bandwidth configurations are supported, measure power for either Channel 6 or the highest specified output power channel.
o Output power measurement requirements for smaller bandwidth configurations are dependent on the SAR measurement results from the 40 MHz bandwidth configurations.
o If no 40 MHz bandwidth configurations are supported, then a channel selection process similar to 802.11b DSSS is applied.
- The output power measurement is required for 2.4 GHz 802.11g/n OFDM as a result of 802.11b DSSS reported SAR results, the required test configurations in 2.4 GHz 802.11g/n OFDM are identified as Subsequent Test Configurations with respect to the Initial Test Configuration status assigned to 802.11b DSSS.
- If, for a particular antenna or transmit diversity condition supported by the device, no 802.11b DSSS configurations are available, output power should also be measured as a default for 802.11g/n OFDM when SAR Test Exclusion according to KDB 447498 D01 does not apply; these 802.11g/n OFDM configurations are considered the Initial Test Configurations for the respective antenna/transmit diversity condition.
Initial Test Position SAR Test Reduction
For both DSSS and OFDM wireless modes, when an Initial Test Configuration is found to require SAR measurements, an Initial Test Position is established for each applicable exposure configuration (Head, Body, etc.) using either:

- Design implementation details from the manufacturer, or
- Investigative results by the test lab, obtained by performing area scans on the Initial Test Configuration for all applicable test positions and identifying the highest measured SAR from the area scan-only measurements.

Complete SAR scans are then performed on the established Initial Test Position on each exposure configuration, using the Initial Test Configuration. When the reported SAR for this Initial Test Position is: - ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in the exposure configuration and wireless mode combination within the frequency band or aggregated band. - > 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the initial test position to measure the subsequent next closest/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel until the reported SAR is ≤ 0.8 W/kg or all required test positions are tested.

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

9.2. SAR measurement Results

General Notes:

1) Per KDB447498 D01v06, all measurement SAR results are scaled to the maximum tune-up tolerance limit to demonstrate compliant.
2) Per KDB447498 D01v06, 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 2.0W/kg, for 1-g or 10-g respectively, when the transmission band is ≤100MHz. When the maximum output power variation across the required test channels is >1/2 dB, instead of the middle channel, the highest output power channel must be used.
3) Per KDB865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measure 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 KDB 941225 D06 Hotspot Mode SAR v02:r01, the DUT dimension is bigger than 9cm*5cm, 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 D04v01r03, SAR is evaluated without a headset connected to the device. When the standalone reported body-worn SAR is ≤1.2W/kg, no additional SAR evaluations using a headset are required.
6) Per KDB865664 D02v01r02, 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 >1.5W/kg, or >7.0W/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 plots-processing (refer to appendix B for details).

GSM Notes:

Per KDB941225 D01v03r01, 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 KDB 941225 D01v03r01, when maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤1/4dB 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..

Per KDB941225 D01v03, 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 secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.

WLAN Notes

Per KDB 248227 D01v02r02, for all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

Per KDB 248227 D01v02r02, for 802.11g/n SAR testing is required. 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.

Per KDB 248227 D01v02r02, for OFDM transmission configurations in the 2.4 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11g/n mode is used for SAR measurement, on the highest measured output power channel for each frequency band.

9.3. GSM 850 SAR results

GSM 850 Body

Distance 10mm

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
GSM850	GPRS (GMSK, 2 Tx slots)	Front Side	128	824.2	**31.60**	**32**	**1.096**	**0.751**	**0.823**
GSM850	GPRS (GMSK, 2 Tx slots)	Front Side	190	836.6	31.56	32	1.107	0.724	0.801
GSM850	GPRS (GMSK, 2 Tx slots)	Front Side	251	848.8	31.83	32	1.040	0.698	0.726
GSM850	GPRS (GMSK, 2 Tx slots)	Back Side	190	836.6	31.56	32	1.107	0.627	0.694
GSM850	GPRS (GMSK, 2 Tx slots)	Right Side	190	836.6	31.56	32	1.107	0.349	0.386
GSM850	GPRS (GMSK, 2 Tx slots)	Top Side	190	836.6	31.56	32	1.107	0.374	0.414
GSM850	GPRS (GMSK, 2 Tx slots)	Bottom Side	190	836.6	31.56	32	1.107	0.136	0.151

9.4. PCS 1900 SAR results

GSM 1900 Body

Distance 10 mm

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
GSM1900	GPRS (GMSK, 2 Tx slots)	Front Side	661	1880	**28.02**	**29.0**	**1.253**	**0.381**	**0.477**
GSM1900	GPRS (GMSK, 2 Tx slots)	Back Side	661	1880	28.02	29.0	1.253	0.362	0.454
GSM1900	GPRS (GMSK, 2 Tx slots)	Right Side	661	1880	28.02	29.0	1.253	0.174	0.218
GSM1900	GPRS (GMSK, 2 Tx slots)	Top Side	661	1880	28.02	29.0	1.253	0.336	0.421
GSM1900	GPRS (GMSK, 2 Tx slots)	Bottom Side	661	1880	28.02	29.0	1.253	0.352	0.441

9.5. UMTS Band II SAR results

UMTS Band II Body

Distance 10mm

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
UMTS Band II	RMC12.2	Front Side	9400	1880.0	**23.18**	**24.0**	**1.208**	**0.365**	**0.441**
UMTS Band II	RMC12.2	Back Side	9400	1880.0	23.18	24.0	1.208	0.324	0.391
UMTS Band II	RMC12.2	Right Side	9400	1880.0	23.18	24.0	1.208	0.147	0.178
UMTS Band II	RMC12.2	Top Side	9400	1880.0	23.18	24.0	1.208	0.312	0.377
UMTS Band II	RMC12.2	Bottom Side	9400	1880.0	23.18	24.0	1.208	0.193	0.233

9.6. UMTS Band IV SAR results

UMTS Band IV Body

Distance 10mm

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
UMTS Band IV	RMC12.2	Front Side	1413	1740.0	**22.48**	**23.0**	**1.127**	**0.523**	**0.59**
UMTS Band IV	RMC12.2	Back Side	1413	1740.0	22.48	23.0	1.127	0.477	0.538
UMTS Band IV	RMC12.2	Right Side	1413	1740.0	22.48	23.0	1.127	0.153	0.172
UMTS Band IV	RMC12.2	Top Side	1413	1740.0	22.48	23.0	1.127	0.465	0.524
UMTS Band IV	RMC12.2	Bottom Side	1413	1740.0	22.48	23.0	1.127	0.079	0.089

9.7. UMTS Band V SAR results

UMTS Band V Body

Distance 10mm

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
UMTS Band V	RMC12.2	Front Side	4182	836.4	**23.45**	**24.0**	**1.135**	**0.447**	**0.507**
UMTS Band V	RMC12.2	Back Side	4182	836.4	23.45	24.0	1.135	0.317	0.36
UMTS Band V	RMC12.2	Right Side	4182	836.4	23.45	24.0	1.135	0.324	0.368
UMTS Band V	RMC12.2	Top Side	4182	836.4	23.45	24.0	1.135	0.339	0.385
UMTS Band V	RMC12.2	Bottom Side	4182	836.4	23.45	24.0	1.135	0.354	0.402

9.8. LTE Band 2 SAR results

LTE Band 2 Body

Distance 10mm

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
LTE Band 2	20M QPSK (1#49)	Front Side	18900	1880.0	**23.15**	**24.0**	**1.216**	**0.484**	**0.589**
LTE Band 2	20M QPSK (1#49)	Back Side	18900	1880.0	23.15	24.0	1.216	0.413	0.502
LTE Band 2	20M QPSK (1#49)	Right Side	18900	1880.0	23.15	24.0	1.216	0.102	0.124
LTE Band 2	20M QPSK (1#49)	Top Side	18900	1880.0	23.15	24.0	1.216	0.431	0.524
LTE Band 2	20M QPSK (1#49)	Bottom Side	18900	1880.0	23.15	24.0	1.216	0.059	0.072
LTE Band 2	20M QPSK (RB50#0)	Front Side	18900	1880.0	23.15	24.0	1.216	0.48	0.584
LTE Band 2	20M QPSK (RB50#0)	Back Side	18900	1880.0	23.15	24.0	1.216	0.406	0.494
LTE Band 2	20M QPSK (RB50#0)	Right Side	18900	1880.0	23.15	24.0	1.216	0.09	0.109
LTE Band 2	20M QPSK (RB50#0)	Top Side	18900	1880.0	23.15	24.0	1.216	0.422	0.513
LTE Band 2	20M QPSK (RB50#0)	Bottom Side	18900	1880.0	23.15	24.0	1.216	0.05	0.061

9.9. LTE Band 4 SAR results

LTE Band 4 Body

Distance 10mm

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
LTE Band 4	20M QPSK (1#49)	Front Side	20175	1732.5	**22.85**	**23.0**	**1.035**	**0.345**	**0.357**
LTE Band 4	20M QPSK (1#49)	Back Side	20175	1732.5	22.85	23.0	1.035	0.317	0.328
LTE Band 4	20M QPSK (1#49)	Right Side	20175	1732.5	22.85	23.0	1.035	0.236	0.244
LTE Band 4	20M QPSK (1#49)	Top Side	20175	1732.5	22.85	23.0	1.035	0.296	0.306
LTE Band 4	20M QPSK (1#49)	Bottom Side	20175	1732.5	22.85	23.0	1.035	0.072	0.075
LTE Band 4	20M QPSK (RB50#0)	Front Side	20175	1732.5	22.85	23.0	1.035	0.336	0.348
LTE Band 4	20M QPSK (RB50#0)	Back Side	20175	1732.5	22.85	23.0	1.035	0.31	0.321
LTE Band 4	20M QPSK (RB50#0)	Right Side	20175	1732.5	22.85	23.0	1.035	0.229	0.239
LTE Band 4	20M QPSK (RB50#0)	Top Side	20175	1732.5	22.85	23.0	1.035	0.294	0.304
LTE Band 4	20M QPSK (RB50#0)	Bottom Side	20175	1732.5	22.85	23.0	1.035	0.07	0.072

9.10.LTE Band 12 SAR results

LTE Band 12 Body

Distance 10mm

Band	Mode	Test Position	Ch.	Freq. (MHz)	Burst Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
LTE Band 12	10M QPSK (1#49)	Front Side	23095	2535	23.49	24.0	1.125	0.62	0.697
LTE Band 12	10M QPSK (1#49)	Back Side	23060	2510	23.88	24.0	1.028	0.85	0.874
LTE Band 12	10M QPSK (1#49)	Back Side	23095	2535	23.49	24.0	1.125	0.76	0.855
LTE Band 12	10M QPSK (1#49)	Back Side	23130	2560	**23.40**	**24.0**	**1.148**	**0.87**	**0.999**
LTE Band 12	10M QPSK (1#49)	Right Side	23095	2535	23.49	24.0	1.125	0.147	0.165
LTE Band 12	10M QPSK (1#49)	Top Side	23095	2535	23.49	24.0	1.125	0.339	0.381
LTE Band 12	10M QPSK (1#49)	Bottom Side	23095	2535	23.49	24.0	1.125	0.364	0.409
LTE Band 12	10M QPSK (RB50#0)	Front Side	23095	2535	23.49	24.0	1.125	0.58	0.652
LTE Band 12	10M QPSK (RB50#0)	Back Side	23060	2510	23.88	24.0	1.028	0.75	0.771
LTE Band 12	10M QPSK (RB50#0)	Back Side	23095	2535	23.49	24.0	1.125	0.65	0.731
LTE Band 12	10M QPSK (RB50#0)	Back Side	23130	2560	23.40	24.0	1.148	0.79	0.907
LTE Band 12	10M QPSK (RB50#0)	Right Side	23095	2535	23.49	24.0	1.125	0.116	0.13
LTE Band 12	10M QPSK (RB50#0)	Top Side	23095	2535	23.49	24.0	1.125	0.305	0.343
LTE Band 12	10M QPSK (RB50#0)	Bottom Side	23095	2535	23.49	24.0	1.125	0.29	0.326

9.11.WIFI SAR results

WIFI Body (Antenna 1#)

Distance 10mm

Band	Mode	Test Position	Ch.	Freq. (MHz)	Area scan SAR 1-g (W/kg)	
WIFI 2.4G	802.11b	Front Side	6	2437	0.103	/
WIFI 2.4G	802.11b	Back Side	6	2437	0.117	/
WIFI 2.4G	802.11b	Right Side	6	2437	0.031	/
WIFI 2.4G	802.11b	Bottom Side	**6**	**2437**	**0.138**	**Initial test position**

Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
WIFI 2.4G	802.11b	Bottom Side	6	2437	16.90	18.0	1.288	0.149	0.192

WIFI Body (Antenna 2#)

Distance 10mm

Band	Mode	Test Position	Ch.	Freq. (MHz)	Area scan SAR 1-g (W/kg)	
WIFI 2.4G	802.11b	Front Side	6	2437	0.146	/
WIFI 2.4G	802.11b	Back Side	6	2437	0.186	/
WIFI 2.4G	802.11b	Left Side	6	2437	0.165	/
WIFI 2.4G	802.11b	Top Side	**6**	**2437**	**0.23**	**Initial test position**

Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
WIFI 2.4G	802.11b	Top Side	6	2437	15.41	16.0	1.146	0.238	0.273

WIFI Body (MIMO)

Distance 10mm

Band	Mode	Test Position	Ch.	Freq. (MHz)	Area scan SAR 1-g (W/kg)	
WIFI 2.4G	802.11b	Front Side	6	2437	0.291	/
WIFI 2.4G	802.11b	Back Side	6	2437	0.082	/
WIFI 2.4G	802.11b	Left Side	6	2437	0.074	/
WIFI 2.4G	802.11b	Top Side	**6**	**2437**	**0.310**	**Initial test position**
WIFI 2.4G	802.11b	Bottom Side	6	2437	0.136	/

Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
WIFI 2.4G	802.11b	Front Side	6	2437	19.22	20	1.197	0.317	0.339

9.12.Repeated SAR results

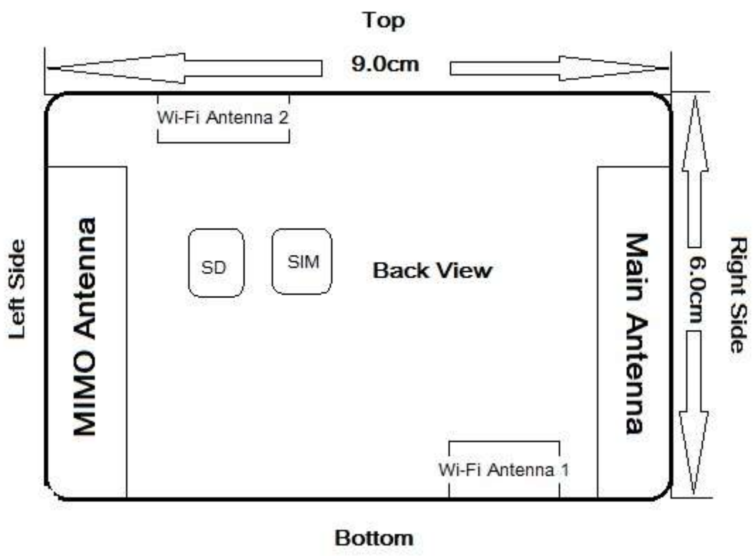
Remark:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR<1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated measured SAR.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
GSM850	GPRS (GMSK, 2 Tx slots)	Front Side	128	824.2	31.60	32	1.096	0.748	0.82
GSM850	GPRS (GMSK, 2 Tx slots)	Front Side	190	836.6	31.56	32	1.107	0.72	0.797
LTE Band 12	10M QPSK (1#49)	Back Side	23060	2510	23.88	24.0	1.028	0.839	0.863
LTE Band 12	10M QPSK (1#49)	Back Side	23095	2535	23.49	24.0	1.125	0.74	0.832
LTE Band 12	10M QPSK (1#49)	Back Side	23130	2560	23.40	24.0	1.148	0.859	0.986
LTE Band 12	10M QPSK (RB50#0)	Back Side	23130	2560	23.40	24.0	1.148	0.77	0.884

10. EXPOSURE POSITIONS CONSIDERATION

10.1. Multiple Transmitter Evaluation



Mode	Front Side	Back Side	Left Side	Right Side	Top Side	Bottom Side
Main Antenna	YES	YES	NO	YES	YES	YES
Wi-Fi 2.4G Antenna 1	YES	YES	NO	YES	NO	YES
Wi-Fi 2.4G Antenna 2	YES	YES	YES	NO	YES	NO
MIMO Antenna	YES	YES	YES	NO	YES	YES

10.2.Simultaneous Transmission Possibilities

The Simultaneous Transmission Possibilities of this device are as below:

No.	Configuration	Hotspot
1	GSM(voice)+ WiFi2.4G	N/A
2	GPRS/EDGE(DATA)+ WiFi2.4G	Yes
3	UMTS(Voice)+ WiFi2.4G	N/A
4	UMTS(DATA)+ WiFi2.4G	Yes
5	LTE(DATA)+WiFi2.4G	Yes

Table 5: Simultaneous Transmission Possibilities

Note:

1) Wi-Fi 2.4G and Bluetooth share the same Tx antenna and can’t transmit simultaneously.
2) 2G&3G&4G can’t transmit simultaneously.
3) Held to ear configurations are not applicable to Bluetooth and therefore were not considered for simultaneous transmission.

10.3.SAR Summation Scenario

Test Position		Front Side (10mm)	Back Side (10mm)	Left Side (10mm)	Right Side (10mm)	Top Side (10mm)	Bottom Side (10mm)
MAX 1-g SAR (W/kg)	GSM850	0.823	0.694	/	**0.386**	0.414	0.151
	GSM1900	0.477	0.454	/	0.218	0.421	**0.441**
	UMTS Band II	0.441	0.391	/	0.178	0.377	0.233
	UMTS Band IV	0.59	0.538	/	0.172	**0.524**	0.089
	UMTS Band V	0.507	0.36	/	0.368	0.385	0.402
	LTE Band 2	0.589	0.502	/	0.124	**0.524**	0.072
	LTE Band 4	0.357	0.328	/	0.244	0.306	0.075
	LTE Band 12	**0.697**	**0.999**	/	0.165	0.381	0.409
	2.4G Wi-Fi (Ant 1#)	0.192	0.192	/	**0.192**	/	0.192
	2.4G Wi-Fi (Ant 2#)	0.273	0.273	0.273	/	0.273	/
	2.4G Wi-Fi (MIMO)	**0.339**	**0.339**	**0.339**	/	**0.339**	**0.339**
Σ1-g SAR(W/kg)		1.036	**1.338**	0.339	0.578	0.863	0.78

10.4.Simultaneous Transmission Conclusion

The above numeral summed SAR results and SPLSR analysis is sufficient to determine that simultaneous cases will not exceed the SAR limit and therefore simultaneous transmission SAR with Volume Scan is not required per KDB 447498 D01v06

11. PHOTOGRAPHS OF THE TEST SET-UP

Photo 1: Measurement System DASY5	Photo 2: Front View
	
Photo 3: Rear View	Photo 4: Front Side 10mm
	
Photo 5: Back Side 10mm	Photo 6: Left Side 10mm
	

Photo 7: Right Side 10mm	Photo 8: Top Side 10mm
	
Photo 9: Bottom Side 10mm	N/A
	N/A

Photograph: Liquid depth

Photo 10: Body 850 Depth (15.0cm)	Photo 11: Body1900 Depth (15.0cm)

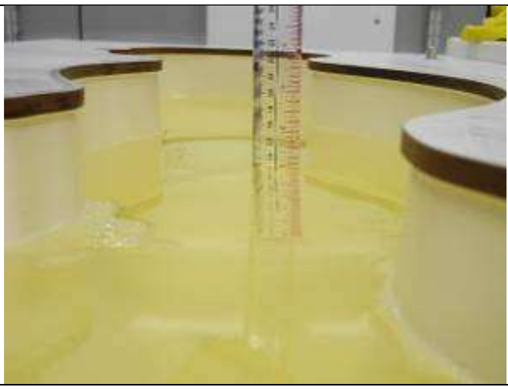
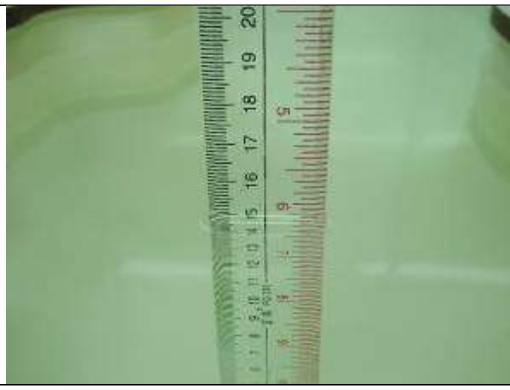

	

Photo 12: Body2450 Depth (15.0cm)	Photo 13: Body750 Depth(15.0cm)

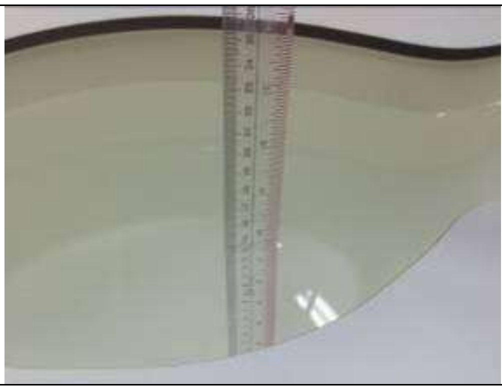
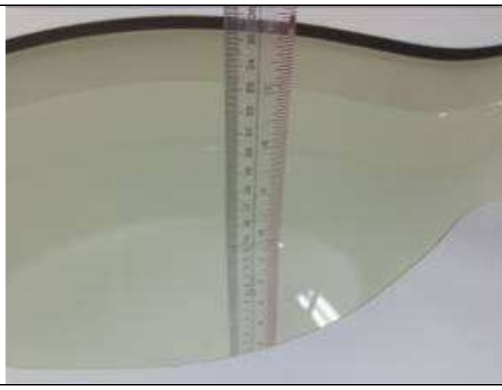
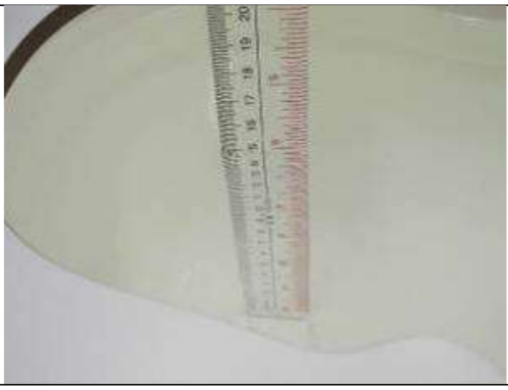

	

Photo 14: Body1750 Depth(15.0cm)	N/A
	N/A

Appendix A. System Check Plots

(Pls see Appendix A)

Appendix B. MEASUREMENT SCANS

(Pls see Appendix B)

AppendixC RELEVANT PAGES FROM PROBE CALIBRATION REPORT(S)

(Pls see Appendix C)

Appendix D. RELEVANT PAGES FROM DAE&DIPOLE VALIDATION KIT REPORT(S)

(Pls see Appendix D)