SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch

FCC SAR TEST REPORT

Application No.:	ZEWM2312001976RG
Applicant:	Shenzhen Zhong Qing Chuang Technology Co.,Ltd
Manufacturer:	Shenzhen Zhong Qing Chuang Technology Co.,Ltd
Product Name:	Tablet
Model No.(EUT):	ZQC-P1, T1,P2,M104, M105, M107, M108, M109, M115, M116, M118, M119, M20, H717, H719, H720, H80, H815, H816, H818.
Trade Mark:	Interpad
FCC ID:	2BBQH-P2
Standards:	FCC 47CFR §2.1093
Date of Receipt:	2024/01/16
Date of Test:	2024/02/20 to 2024/02/27
Date of Issue:	2024/02/29
Test conclusion:	**PASS ***

* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Authorized Signature:

Keny Xu
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REVISION HISTORY

Report Number	Revision	Description	Issue Date
ZEWM2312001976RG07	01	Original	2024/02/29

Prepared By	Vito Wang **Vito Wang**
Checked By	Roman Pan **Roman Pan**

TEST SUMMARY

Frequency Band	Maximum Reported SAR(W/kg)
	Body 0mm
GSM850	0.93
GSM1900	0.91
WCDMA Band II	**0.94**
WCDMA Band V	0.84
LTE Band 2	0.78
LTE Band 5	0.86
LTE Band 12	0.87
LTE Band 13	0.74
LTE Band 66/4	0.93
WI-FI (2.4GHz)	0.21
WI-FI (5GHz)	0.47
BT	0.19
SAR Limited(W/kg)	1.6
Maximum Simultaneous Transmission SAR (W/kg)	
Scenario	Body
Sum SAR	1.40
SPLSR	/
SPLSR Limited	0.04

Note:
1) The Simultaneous transmission SAR is the same test position of the WWAN antenna + WiFi/BT antenna.
2) According to TCB workshop (Overlapping LTE Bands): SAR in LTE band 4 (frequency range: 1710~1755 MHz) is covered by LTE band 66 (frequency range: 1710~1780 MHz). Because the frequency range is similar, the maximum tuning limit is the same, and the channel bandwidth and other operating parameters for the smaller band is fully supported by the larger band.

CONTENTS

1 GENERAL INFORMATION 6
1.1 DETAILS OF CLIENT 6
1.2 TEST LOCATION 6
1.3 TEST FACILITY 7
1.4 GENERAL DESCRIPTION OF EUT 8
1.5 TEST SPECIFICATION 10
1.6 RF EXPOSURE LIMITS 11
2 LABORATORY ENVIRONMENT 12
3 SAR MEASUREMENTS SYSTEM CONFIGURATION 13
3.1 THE SAR MEASUREMENT SYSTEM 13
3.2 ISOTROPIC E-FIELD PROBE EX3DV4 14
3.3 DATA ACQUISITION ELECTRONICS (DAE) 15
3.4 SAM TWIN PHANTOM 15
3.5 ELI PHANTOM 16
3.6 DEVICE HOLDER FOR TRANSMITTERS 17
3.7 MEASUREMENT PROCEDURE 18
3.7.1 Scanning procedure 18
3.7.2 Data Storage 20
3.7.3 Data Evaluation by SEMCAD 20
4 SAR MEASUREMENT VARIABILITY AND UNCERTAINTY 22
4.1 SAR MEASUREMENT VARIABILITY 22
4.2 SAR MEASUREMENT UNCERTAINTY 22
5 DESCRIPTION OF TEST POSITION 23
5.1 THE TEST POSITION 23
6 SAR SYSTEM VERIFICATION PROCEDURE 24
6.1 TISSUE SIMULATE LIQUID 24
6.1.1 Recipes for Tissue Simulate Liquid 24
6.1.2 Measurement for Tissue Simulate Liquid 25
6.2 SAR SYSTEM CHECK 26
6.2.1 Justification for Extended SAR Dipole Calibrations 27
6.2.2 Summary System Check Result(s) 28
6.2.3 Detailed System Check Results 28
7 TEST CONFIGURATION 29
7.1 3G SAR TEST REDUCTION PROCEDURE 29
7.2 OPERATION CONFIGURATIONS 29
7.2.1 GSM Test Configuration 29
7.2.2 WCDMA Test Configuration 30
7.2.3 WiFi Test Configuration 34
7.2.4 LTE Test Configuration 41
8 TEST RESULT 43

8.1 MEASUREMENT OF RF CONDUCTED POWER 43
8.2 MEASUREMENT OF SAR DATA........ 45
8.2.1 SAR Result of GSM850........ 46
8.2.2 SAR Result of GSM1900 47
8.2.3 SAR Result of WCDMA Band II 48
8.2.4 SAR Result of WCDMA Band V........ 49
8.2.5 SAR Result of LTE Band 2 50
8.2.6 SAR Result of LTE Band 5 51
8.2.7 SAR Result of LTE Band 12........ 52
8.2.8 SAR Result of LTE Band 13........ 53
8.2.9 SAR Result of LTE Band 66........ 54
8.2.10 SAR Result of WIFI 2.4G 55
8.2.11 SAR Result of WIFI 5G........ 56
8.2.12 SAR Result of BT 57
8.3 MULTIPLE TRANSMITTER EVALUATION 58
8.3.1 Simultaneous SAR SAR test evaluation........ 58
8.3.2 Simultaneous Transmission SAR Summation Scenario 59

9 EQUIPMENT LIST 60

10 CALIBRATION CERTIFICATE........62

11 PHOTOGRAPHS 62

APPENDIX A: DETAILED SYSTEM CHECK RESULTS........62

APPENDIX B: DETAILED TEST RESULTS 62

APPENDIX C: CALIBRATION CERTIFICATE 62

APPENDIX D: PHOTOGRAPHS........62

APPENDIX E: CONDUCTED RF OUTPUT POWER........62

APPENDIX F: ANTENNA LOCATIONS 62

1 General Information

1.1 Details of Client

Applicant:	Shenzhen Zhong Qing Chuang Technology Co.,Ltd
Address:	5F Building D, No. 18 Guangyao Industrial Plant, Fourth Industrial Zone, Zhulongtian Road, Shuitian Community, Shiyan Street, Baoan District, Shenzhen
Manufacturer:	Shenzhen Zhong Qing Chuang Technology Co.,Ltd
Address:	5F Building D, No. 18 Guangyao Industrial Plant, Fourth Industrial Zone, Zhulongtian Road, Shuitian Community, Shiyan Street, Baoan District, Shenzhen

1.2 Test Location

Company:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Address:	No. 1 Workshop, M-10, Middle section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China
Post code:	518057
Test engineer:	Claire Shen, Charley Yi, Mike Li, Durant Lin, Bernie Zhuang, Messi Chen, James Zheng

1.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

• FCC –Designation Number: CN1336

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch has been recognized as an accredited testing laboratory.

Designation Number: CN1336. Test Firm Registration Number: 787754.

1.4 General Description of EUT

Device Type :	portable device		
Exposure Category:	uncontrolled environment / general population		
Product Name:	Tablet		
Model No.(EUT):	ZQC-P1,T1,P2,M104, M105, M107, M108, M109, M115, M116, M118, M119, M20, H717, H719, H720, H80, H815, H816, H818.		
Trade Mark:	Interpad		
Product Phase:	Identical Prototype		
IMEI:	865237183242215		
Hardware Version:	M9-S1-V2-SU		
Software Version:	M9S1V2.2023121811		
Antenna Type:	FPC Antenna		
Device Operating Configurations :			
Modulation Mode:	**GSM:** GMSK, 8PSK; **WCDMA:** QPSK; **LTE:** QPSK,16QAM, 64QAM, 256QAM **WIFI:** DSSS, OFDM; **BT:** GFSK, π/4DQPSK,8DPSK		
Device Class:	B		
GPRS Multi-slots Class:	9	EGPRS Multi-slots Class:	9
HSDPA UE Category:	24	HSUPA UE Category	6
Power Class:	4,tested with power level 5(GSM850)		
	1,tested with power level 0(GSM1900)		
	3, tested with power control “all 1”(WCDMA Band)		
	3, tested with power control Max Power(LTE Band)		
Frequency Bands:	Band	Tx (MHz)	Rx (MHz)
	GSM850	824~849	869~894
	GSM1900	1850~1910	1930~1990
	WCDMA Band II	1850~1910	1930~1990
	WCDMA Band V	824~849	869~894
	LTE Band 2	1850 ~1910	1930 ~1990
	LTE Band 4	1710~1755	2110~2155
	LTE Band 5	824~849	869-894
	LTE Band 12	699~716	729~746
	LTE Band 13	777~787	746~756
	LTE Band 66	1710~1780	2110-2200
	Bluetooth	2402~2480	2402~2480
	Wi-Fi 2.4G	2412~2462	2412~2462
	Wi-Fi 5G	5150~5250	5150~5250
		5725~5850	5725~5850
RF Cable:	☒ Provided by the applicant ☐ Provided by the laboratory		
Battery Information:	Model:	475372PL	
	Normal Voltage:	+3.8V	
	Rated capacity:	2800mAh	
	Manufacturer:	SHENZHEN YOULONGYUAN TECHNOLOGY CO.,LTD.	
Note: *Since the above data and/or information is provided by the client relevant results or conclusions of this			

report are only made for these data and/or information, SGS is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion.
Remark:
As above information is provided and confirmed by the applicant. SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

Remark:

Only the Model No.(ZQC-P1) was tested in this reprot.According to the Declaration letter from client, the Model No. :T1,P2,M104, M105, M107, M108, M109, M115, M116, M118, M119, M20, H717, H719, H720, H80, H815, H816, H818, just the model name is different,all other functions are the same.

1.5 Test Specification

Identity	Document Title
FCC 47CFR §2.1093	Radio frequency Radiation Exposure Evaluation: Portable Devices
IEEE Std C95.1 – 1992	IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz
IEEE 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
KDB 248227 D01 802.11 Wi-Fi SAR v02r02	SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS
KDB 941225 D01 v03r01	3G SAR Measurement Procedures
KDB 941225 D05 v02r05	SAR for LTE Devices
KDB 941225 D05A v01r02	LTE Rel.10 KDB Inquiry Sheet
KDB 447498 D04 v01	RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices
KDB 865664 D01 v01r04	SAR Measurement Requirements for 100 MHz to 6 GHz
KDB 865664 D02 v01r02	RF Exposure Compliance Reporting and Documentation Considerations
KDB 690783 D01 v01r03	SAR Listings on Grants
KDB 616217 D04 v01r02	SAR EVALUATION CONSIDERATIONS FOR LAPTOP, NOTEBOOK, NETBOOK AND TABLET COMPUTERS

1.6 RF exposure limits

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

Notes:

* The Spatial Peak value of the SAR averaged over any 1 gram 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 10 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 of employment or occupation.)

2 Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

Table 1： The Ambient Conditions

3 SAR Measurements System Configuration

3.1 The SAR Measurement System

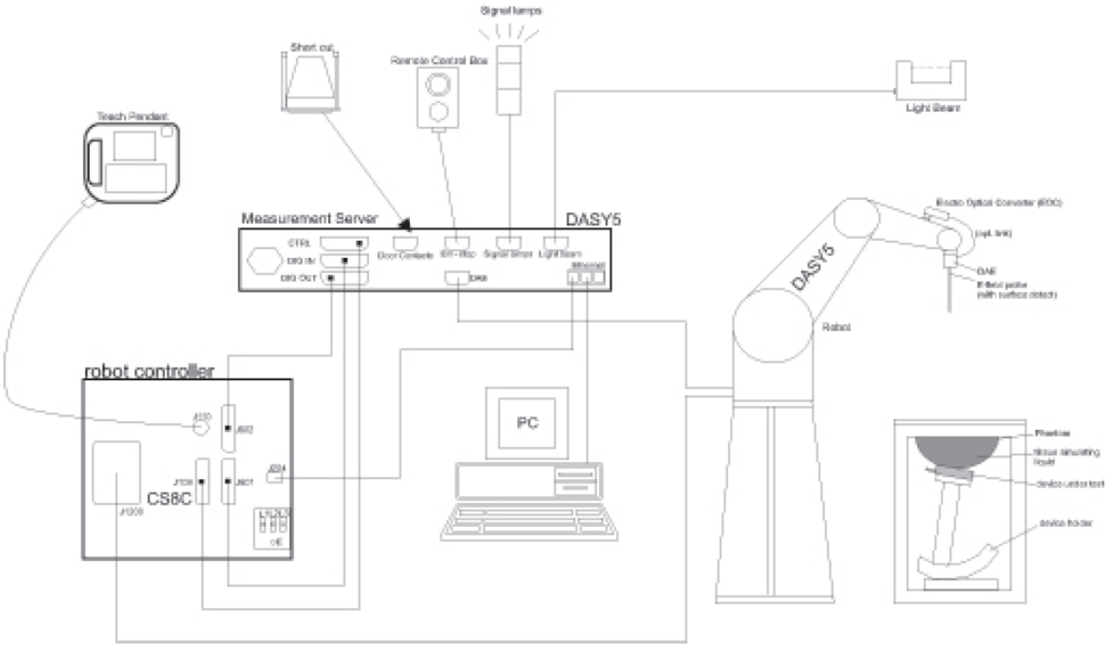
This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY professional system). A E-field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ (|Ei|2)/ ρ where σ and ρ are the conductivity and mass density of the tissue-Simulate.

The DASY system for performing compliance tests consists of the following items:
A standard high precision 6-axis robot (Stabile RX family) with controller, teach pendant and software An arm extension for accommodation 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 electronics (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.

The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.



F-1. SAR Measurement System Configuration

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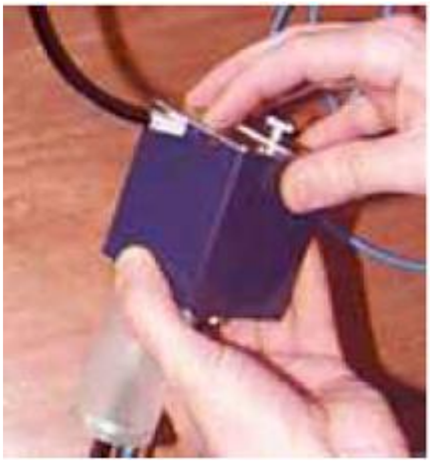
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 7.
- DASY5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand, right-hand and Body Worn usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validating the proper functioning of the system.

3.2 Isotropic E-field Probe EX3DV4

	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (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: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%.
Compatibility	DASY52 SAR and higher, EASY4/MRI

3.3 Data Acquisition Electronics (DAE)

Model	DAE
Construction	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY4/5 embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop.
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4mV,400mV)
Input Offset Voltage	< 5μV (with auto zero)
Input Bias Current	< 50 f A
Dimensions	60 x 60 x 68 mm



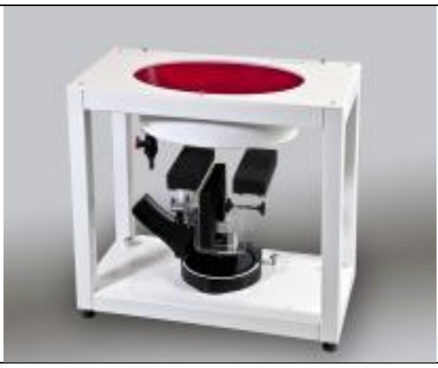
3.4 SAM Twin Phantom

Material	Vinylester, glass fiber reinforced (VE-GF)
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)
Dimensions (incl. Wooden Support)	Length: 1000 mm Width: 500 mm Height: adjustable feet
Filling Volume	approx. 25 liters
Wooden Support	SPEAG standard phantom table

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.

Twin SAM V5.0 has the same shell geometry and is manufactured from the same material as Twin SAM V4.0, but has reinforced top structure.

3.5 ELI Phantom

Material	Vinylester, glass fiber reinforced (VE-GF)	
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)	
Shell Thickness	2.0 ± 0.2 mm (bottom plate)	
Dimensions	Major axis: 600 mm Minor axis: 400 mm	
Filling Volume	approx. 30 liters	
Wooden Support	SPEAG standard phantom table	

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.

ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4, but has reinforced top structure.

3.6 Device Holder for Transmitters

F-2. **Device Holder for Transmitters**

- The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation centres for both scales are the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.
- The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity ε=3 and loss tangent δ=0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

3.7 Measurement procedure

3.7.1 Scanning procedure

Step 1: Power reference measurement

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.

Step 2: *Area scan*

The SAR distribution at the exposed side of the head was measured at a distance of 4mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15mm*15mm or 12mm*12mm or 10mm*10mm.Based on the area scan data, the area of the maximum absorption was determined by spline interpolation.

Step 3: *Zoom scan*

Around this point, a volume of 32mm*32mm*30mm (f≤2GHz), 30mm*30mm*30mm (f for 2-3GHz) and 24mm*24mm*22mm (f for 5-6GHz) was assessed by measuring 5x5x7 points (f≤2GHz), 7x7x7 points (f for 2-3GHz) and 7x7x12 points (f for 5-6GHz). On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

The data at the surface was extrapolated, since the centre of the dipoles is 2.0mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2mm. (This can be variable. Refer to the probe specification).The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The volume was integrated with the trapezoidal algorithm. One thousand points were interpolated to calculate the average. All neighbouring volumes were evaluated until no neighboring volume with a higher average value was found.

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std. 1528-2013.

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Step 4: Power reference measurement (drift)

The Power Drift Measurement job measures the field at the same location as the most recent power reference measurement job within the same procedure, and with the same settings. The indicated drift is mainly the variation of the DUT’s output power and should vary max. ± 5 %

3.7.2 Data Storage

The DASY 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], [m W/g], [m W/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.

3.7.3 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 ε
- 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 DASY 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:

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

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)
dcp i = diode compression point (DASY parameter)

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

E-field probes:

$$E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$$

H-field probes:

$$H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2) / f$$

With 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):

$$E_{tot} = (E_x^2 + E_Y^2 + E_z^2)^{1/2}$$

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

$$SAR = (Etot^2 \cdot \sigma) / (\varepsilon \cdot 1000)$$

with SAR = local specific absorption rate in mW/g
Etot = total field strength in V/m
σ= conductivity in [mho/m] or [Siemens/m]
ε= 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.

$$P_{pwe} = E_{tot}{}^2{}_2 / 3770 \quad \text{or} \quad P_{pwe} = H_{tot}{}^2 \cdot 37.7$$

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

4 SAR measurement variability and uncertainty

4.1 SAR measurement variability

Per KDB 865664 D01 SAR measurement 100 MHz to 6 GHz 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 measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

2) When the original highest measured SAR is ⩾ 0.80 W/kg, repeat that measurement once.

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ⩾ 1.45 W/kg (~ 10% from the 1-g SAR limit).

4) Perform a third repeated measurement only if the original, first or second repeated measurement is ⩾1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

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

4.2 SAR measurement uncertainty

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

5 Description of Test Position

5.1 The Test Position

In these positions, the surface of EUT is touching phantom with 0 mm. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. SAR evaluation for the front surface of tablet display screens are generally not necessary. The SAR Exclusion Threshold in KDB 447498 D04 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent device surface is used to determine if SAR testing is required for the adjacent surfaces, with the adjacent surface positioned against the phantom and the surface containing the antenna positioned perpendicular to the phantom.

6 SAR System Verification Procedure

6.1 Tissue Simulate Liquid

6.1.1 Recipes for Tissue Simulate Liquid

The bellowing tables give the recipes for tissue simulating liquids to be used in different frequency bands：

Ingredients (% by weight)	Frequency (MHz)				
	450	700-900	1750-2000	2300-2500	2500-2700
Water	38.56	40.30	55.24	55.00	54.92
Salt (NaCl)	3.95	1.38	0.31	0.2	0.23
Sucrose	56.32	57.90	0	0	0
HEC	0.98	0.24	0	0	0
Bactericide	0.19	0.18	0	0	0
Tween	0	0	44.45	44.80	44.85

Salt: 99⁺% Pure Sodium Chloride
Sucrose: 98⁺% Pure Sucrose
Water: De-ionized, 16 MΩ⁺ resistivity
HEC: Hydroxyethyl Cellulose
Tween: Polyoxyethylene (20) sorbitan monolaurate

HSL5GHz is composed of the following ingredients：(Manufactured by SPEAG)

Water：50-65%

Mineral oil：10-30%

Emulsifiers：8-25%

Sodium salt：0-1.5%

Table 2： Recipe of Tissue Simulate Liquid

6.1.2 Measurement for Tissue Simulate Liquid

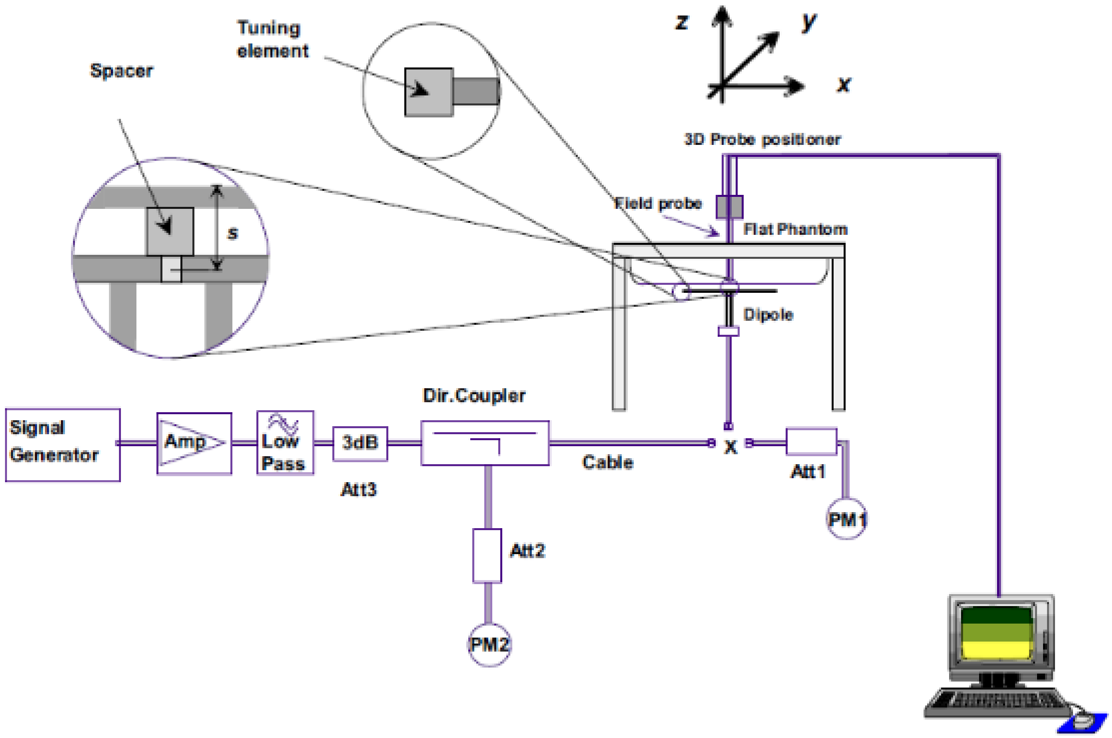
The Conductivity (σ) and Permittivity (ε_r) are listed in bellow table. For the SAR measurement given in this report. The temperature variation of the Tissue Simulate Liquids was 22±2°C.

Tissue Type	Measured Frequency （MHz）	Measured Tissue		Target Tissue (±5%)		Deviation (Within ±5%)		Liquid Temp. (℃)	Test Date
		ε_r	σ(S/m)	ε_r	σ(S/m)	ε_r	σ(S/m)		
750 Head	750	40.956	0.888	41.90	0.89	-2.25%	-0.22%	22.6	2024/2/20
835 Head	835	42.668	0.909	41.50	0.90	2.81%	1.00%	22.8	2024/2/21
1750 Head	1750	39.159	1.371	40.10	1.37	-2.35%	0.07%	22.4	2024/2/22
1900 Head	1900	38.564	1.451	40.00	1.40	-3.59%	3.64%	22.5	2024/2/23
2450 Head	2450	38.664	1.843	39.20	1.80	-1.37%	2.39%	22.6	2024/2/25
5250 Head	5250	35.566	4.629	35.90	4.66	-0.93%	-0.67%	22.1	2024/2/27
5750 Head	5750	34.522	5.277	35.40	5.22	-2.48%	1.09%	22.5	2024/2/27

Table 3： Measurement result of Tissue electric parameters

6.2 SAR System Check

The microwave circuit arrangement for system Check is sketched in F-12. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. The tests were conducted on the same days as the measurement of the EUT. The obtained results from the system accuracy verification are displayed in the following table (A power level of 250mW (below 3GHz) or 100mW (3-6GHz) was input to the dipole antenna). During the tests, the ambient temperature of the laboratory was in the range 22±2°C, the relative humidity was in the range 60% and the liquid depth above the ear reference points was above 15±0.5 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.



F-3. the microwave circuit arrangement used for SAR system check

6.2.1 Justification for Extended SAR Dipole Calibrations

1) Referring to KDB865664 D01 requirements for dipole calibration, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.

a) There is no physical damage on the dipole.
b) System check with specific dipole is within 10% of calibrated value.
c) Return-loss is within 10% of calibrated measurement.
d) Impedance is within 5Ω from the previous measurement.

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

6.2.2 Summary System Check Result(s)

Validation Kit		Measured SAR 250mW	Measured SAR 250mW	Measured SAR (normalized to 1W)	Measured SAR (normalized to 1W)	Target SAR (normalized to 1W)	Target SAR (normalized to 1W)	Deviation (Within ±10%)		Liquid Temp. (℃)	Test Date
		1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1-g(W/kg)	10-g(W/kg)	1-g(W/kg)	10-g(W/kg)		
D750V3	Head	2.16	1.42	8.64	5.68	8.37	5.53	3.23%	2.71%	22.6	2024/2/20
D835V2	Head	2.52	1.64	10.08	6.56	9.53	6.29	5.77%	4.29%	22.8	2024/2/21
D1750V2	Head	9.93	5.30	39.72	21.20	36.60	19.30	8.52%	9.84%	22.4	2024/2/22
D1900V2	Head	10.5	5.44	42.00	21.76	39.50	20.60	6.33%	5.63%	22.5	2024/2/23
D2450V2	Head	13.30	6.20	53.20	24.80	52.20	24.30	1.92%	2.06%	22.6	2024/2/25
Validation Kit		Measured SAR 100mW	Measured SAR 100mW	Measured SAR (normalized to 1W)	Measured SAR (normalized to 1W)	Target SAR (normalized to 1W)	Target SAR (normalized to 1W)	Deviation (Within ±10%)		Liquid Temp. (℃)	Test Date
		1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1-g(W/kg)	10-g(W/kg)	1-g(W/kg)	10-g(W/kg)		
D5GHzV2	Head(5.25GHz)	7.79	2.24	77.90	22.40	77.30	22.10	0.78%	1.36%	22.1	2024/2/26
	Head(5.75GHz)	8.08	2.29	80.80	22.90	77.10	21.30	4.80%	7.51%	22.5	2024/2/27

Table 4： SAR System Check Result

6.2.3 Detailed System Check Results

Please see the Appendix A

7 Test Configuration

7.1 3G SAR Test Reduction Procedure

According to KDB 941225D01, 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. 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.

7.2 Operation Configurations

7.2.1 GSM Test Configuration

SAR tests for GSM 850 and GSM 1900, a communication link is set up with a base station by air link. Using Radio Communication Analyzer, the power lever is set to “5”and “0” in SAR of GSM 850 and GSM 1900. The tests in the band of GSM 850 and GSM 1900 are performed in the mode of GPRS/EGPRS function. Since the GPRS class is 9 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5. The EGPRS class is 9 for this EUT, it has at most 3 timeslots in uplink, and at most 2 timeslots in downlink, the maximum total timeslot is 5.

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.

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

The 3G SAR test reduction procedure is applied to 8-PSK EDGE with GMSK GPRS/EDGE as the primary mode

7.2.2 WCDMA Test Configuration

1）. 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 required 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.

2）. Body SAR

SAR for body 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.

3）. HSDPA / HSUPA

According to KDB 941225 D01v03, RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA

a) HSDPA

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

Sub-test	βc	Bd	βd(SF)	βc/βd	βhs	CM(dB)	MPR (dB)
1	2/15	15/15	64	2/15	4/15	0.0	0
2	12/15(3)	15/15(3)	64	12/15(3)	24/15	1.0	0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note1: △ACK, △NACK and △CQI= 8 Ahs = βhs/βc=30/15 βhs=30/15*βc
Note2: For the HS-DPCCH power mask requirement test in clause 5.2C,5.7A,and the Error Vector Magnitude(EVM) with HS-DPCCH test in clause 5.13.1.A,and HSDPA EVM with phase discontinuity in clause 5.13.1AA, △ACK and △NACK= 8 (Ahs=30/15) with βhs=30/15*βc,and △CQI= 7 (Ahs=24/15) with βhs=24/15*βc.
Note3: CM=1 forβc/βd =12/15, βhs/βc=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

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

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

Table 5： settings of required H-Set 1 QPSK acc. to 3GPP 34.121

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

Table 6： HSDPA UE category

b) HSUPA

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

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

Note 1: Δ ACK, Δ NACK and Δ CQI = 8 $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference

Note 3 : For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$

Note 4 : For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$

Note 5 : Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g

Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Table 7： Subtests for UMTS Release 6 HSUPA

UE E-DCH Category	Maximum E-DCH Codes Transmitted	Number of HARQ Processes	E-DCH TTI(ms)	Minimum Speading 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	10	2SF2&2SF4	11484	5.76
	4	4	2		20000	2.00
7 (No DPDCH)	4	8	2	2SF2&2SF4	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 support QPSK only. UE category 7 supports QPSK and 16QAM.(TS25.306-7.3.0).						

Table 8： HSUPA UE category

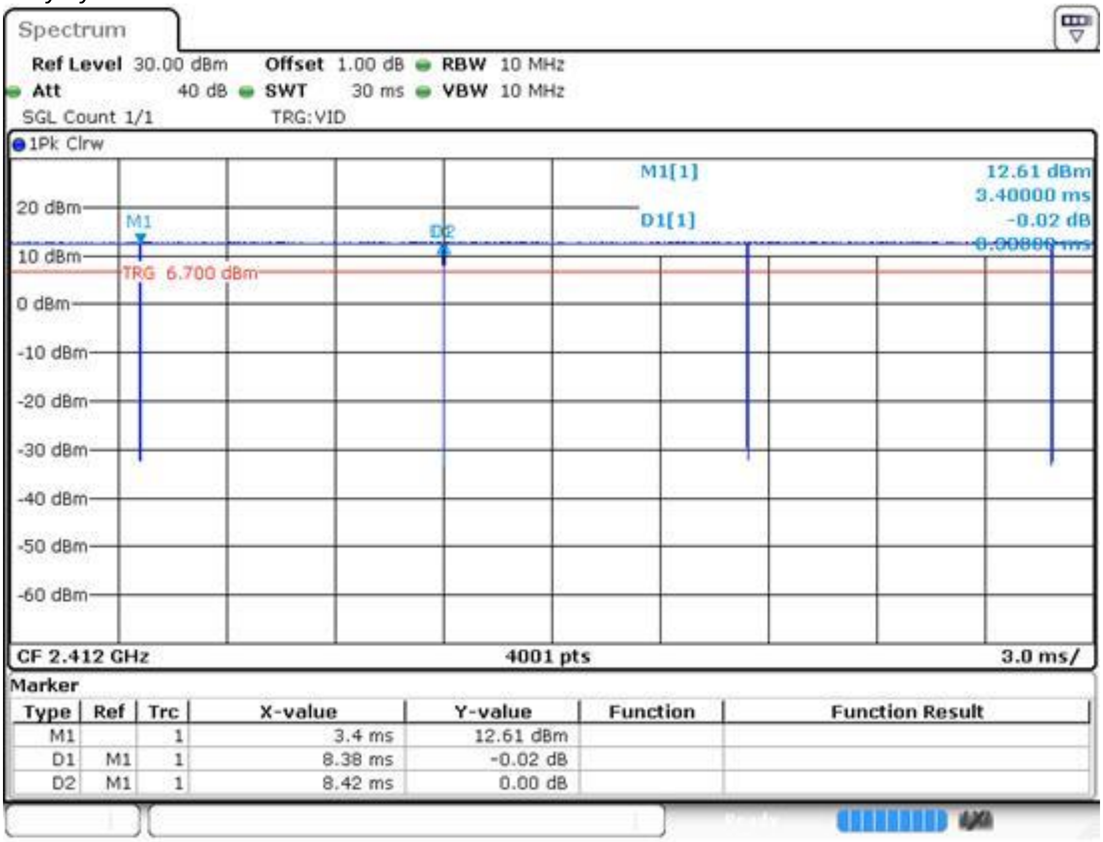
7.2.3 WiFi Test Configuration

A Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement.

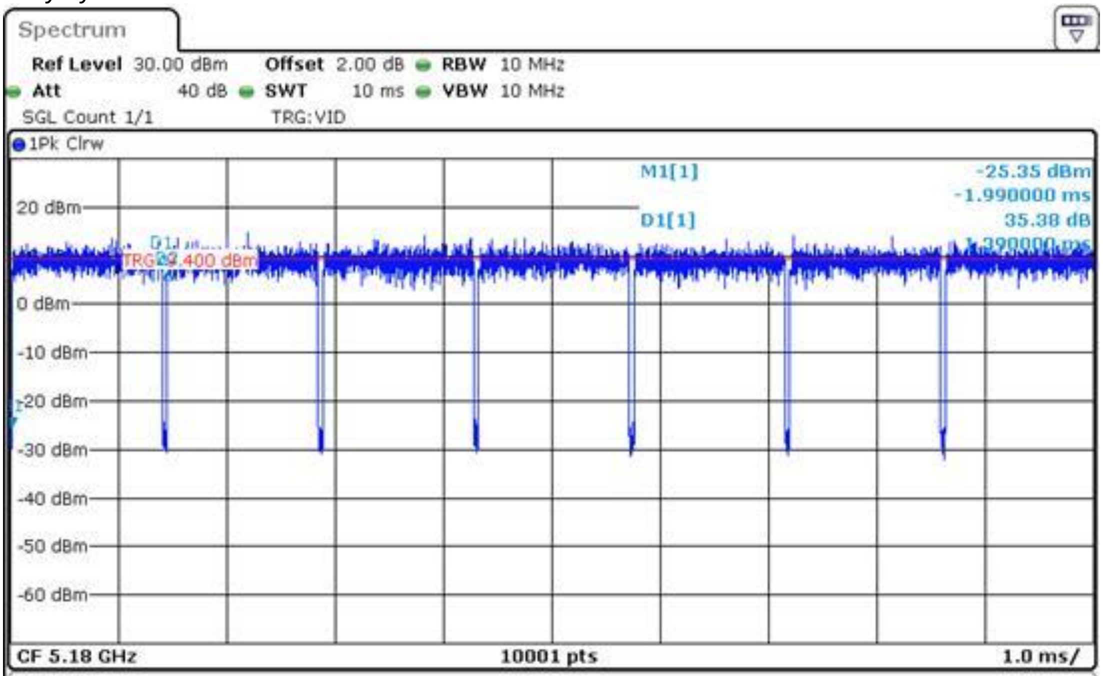
7.2.3.1 Duty cycle

1) Wi-Fi 2.4GHz 802.11b:

Duty cycle=8.38/8.42=99.52%



2) Wi-Fi 5GHz 802.11a:
Duty cycle=1.39/1.44=96.53%



Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-1.99 ms	-25.35 dBm		
D1	M1	1	1.39 ms	35.38 dB		
D2	M1	1	1.44 ms	32.24 dB		

7.2.3.2 Initial Test Position SAR Test Reduction Procedure

DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures. The initial test position procedure is described in the following:

1）. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band. SAR is also not required for that exposure configuration in the subsequent test configuration(s).

2）. When the reported SAR of the initial test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position using subsequent highest extrapolated or estimated 1-g SAR conditions determined by area scans or next closest/smallest test separation distance and maximum RF coupling test positions based on manufacturer justification, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions (left, right, touch, tilt or subsequent surfaces and edges) are tested.

3）. 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. a) Additional power measurements may be required for this step, which should be limited to those necessary for identifying the subsequent highest output power channels.

7.2.3.3 Initial Test Configuration Procedures

An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required. SAR test reduction for subsequent highest output test channels is determined according to *reported* SAR of the initial test configuration.
For next to the ear, hotspot mode and UMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR measurement using the initial test configuration transmission mode. For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration.
When the *reported* SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for subsequent next highest measured output power channel(s) in the initial test configuration until *reported* SAR is ≤ 1.2 W/kg or all required channels are tested.

7.2.3.4 Subsequent Test Configuration Procedures

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units. The initial test position procedure is applied to next to the ear, UMPC mini-tablet and hotspot mode configurations. When the same maximum output power is specified for multiple transmission modes, additional power measurements may be required to determine if SAR measurements are required for subsequent highest output power channels in a subsequent test configuration. The subsequent test configuration and SAR measurement procedures are described in the following.

1）. When SAR test exclusion provisions of KDB Publication 447498 are applicable and SAR measurement is not required for the initial test configuration, SAR is also not required for the next highest maximum output power transmission mode subsequent test configuration(s) in that frequency band or aggregated band and exposure configuration.

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2）. When the highest *reported* SAR for the initial test configuration (when applicable, include subsequent highest output channels), according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

3）. The number of channels in the initial test configuration and subsequent test configuration can be different due to differences in channel bandwidth. When SAR measurement is required for a subsequent test configuration and the channel bandwidth is smaller than that in the initial test configuration, all channels in the subsequent test configuration that overlap with the larger bandwidth channel tested in the initial test configuration should be used to determine the highest maximum output power channel. This step requires additional power measurement to identify the highest maximum output power channel in the subsequent test configuration to determine SAR test reduction.

a) SAR should first be measured for the channel with highest measured output power in the subsequent test configuration.

b) SAR for subsequent highest measured maximum output power channels in the subsequent test configuration is required only when the *reported* SAR of the preceding higher maximum output power channel(s) in the subsequent test configuration is > 1.2 W/kg or until all required channels are tested. i) For channels with the same measured maximum output power, SAR should be measured using the channel closest to the center frequency of the larger channel bandwidth channel in the initial test configuration.

4）. SAR measurements for the remaining highest specified maximum output power OFDM transmission mode configurations that have not been tested in the initial test configuration (highest maximum output) or subsequent test configuration(s) (subsequent next highest maximum output power) is determined by recursively applying the subsequent test configuration procedures in this section to the remaining configurations according to the following:

a) replace “subsequent test configuration” with “next subsequent test configuration” (i.e., subsequent next highest specified maximum output power configuration)

b) replace “initial test configuration” with “all tested higher output power configurations”

7.2.3.5 2.4 GHz WiFi SAR Procedures

Separate SAR procedures are applied to DSSS and OFDM configurations in the 2.4 GHz band to simplify DSSS test requirements. For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions. When SAR measurement is required for an OFDM configuration, the initial test configuration, subsequent test configuration and initial test position procedures are applied. The SAR test exclusion requirements for 802.11g/n OFDM configurations are described in following.

- **802.11b DSSS SAR Test Requirements**

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

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

2）. When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

- **2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements**

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied (section 5.3, including sub-sections). SAR is not required for the following 2.4 GHz OFDM conditions.

1）. When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.

2）. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

- **SAR Test Requirements for OFDM configurations**

When SAR measurement is required for 802.11 g/n OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

7.2.3.6 5 GHz WiFi SAR Procedures

- **U-NII-1 and U-NII-2A Bands**
  For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following：

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, both bands are tested independently for SAR.
2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, both bands are tested independently for SAR.
3) The two U-NII bands may be aggregated to support a 160 MHz channel on channel number 50. Without additional testing, the maximum output power for this is limited to the lower of the maximum output power certified for the two bands. When SAR measurement is required for at least one of the bands and the highest reported SAR adjusted by the ratio of specified maximum output power of aggregated to standalone band is > 1.2 W/kg, SAR is required for the 160 MHz channel. This procedure does not apply to an aggregated band with maximum output higher than the standalone band(s); the aggregated band must be tested independently for SAR. SAR is not required when the 160 MHz channel is operating at a reduced maximum power and also qualifies for SAR test exclusion.

- **U-NII-2C and U-NII-3 Bands**
  The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. when Terminal Doppler Weather Radar (TDWR) restriction applies, all channels that operate at 5.60 – 5.65 GHz must be included to apply the SAR test reduction and measurement procedures.

  When the same transmitter and antenna(s) are used for U-NII-2C band and U-NII-3 band or 5.8 GHz band of §15.247, the bands may be aggregated to enable additional channels with 20, 40 or 80 MHz bandwidth to span across the band gap, as illustrated in Appendix B. The maximum output power for the additional band gap channels is limited to the lower of those certified for the bands. Unless band gap channels are permanently disabled, they must be considered for SAR testing. The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NII-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NII-3 or §15.247 band to enable two SAR probe calibration frequency points to cover the bands, including the band gap channels. When band gap channels are supported and the bands are not aggregated for SAR testing, band gap channels must be considered independently in each band according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

- **OFDM Transmission Mode SAR Test Configuration and Channel Selection Requirements**
  The initial test configuration for 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures. When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.
  1) The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.
  2) If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.
  3) If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.
  4) When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n.
     After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following. These channel selection procedures apply to both the initial test configuration and subsequent test configuration(s), with respect to the default power measurement procedures or additional power measurements required for further SAR test reduction. The same procedures also apply to subsequent highest output power channel(s) selection.
     a) The channel closest to mid-band frequency is selected for SAR measurement.
     b) For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.

- **SAR Test Requirements for OFDM configurations**

When SAR measurement is required for 802.11 a/n/ac OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. When the same transmitter and antenna(s) are used for U-NII-1 and U-NII-2A bands, additional SAR test reduction applies. When band gap channels between U-NII-2C band and 5.8 GHz U-NII-3 or §15.247 band are supported, the highest maximum output power transmission mode configuration and maximum output power channel across the bands must be used to determine SAR test reduction, according to the initial test configuration and subsequent test configuration requirements. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

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7.2.4 LTE Test Configuration

LTE modes were tested according to FCC KDB 941225 D05 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The Radio Communication Analyzer was used for LTE output power measurements and SAR testing. Max power control was used so the UE transmits with maximum output power during SAR testing. SAR must be measured with the maximum TTI (transmit time interval) supported by the device in each LTE configuration.

A) Spectrum Plots for RB Configurations

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

B) MPR

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.

Modulation	Channel bandwidth/Transmission bandwidth						MPR (dB)
	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	0
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	1
16QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	1
16QAM	> 5	> 4	> 8	> 12	> 16	> 18	2
64QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	2
64QAM	> 5	> 4	> 8	> 12	> 16	> 18	3
256QAM	≥1						5

C) A-MPR

A-MPR (Additional MPR) has been disabled for all SAR tests by setting NS=01 on the base station simulator.

D) Largest channel bandwidth standalone SAR test requirements

1) QPSK with 1 RB allocation

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

2) QPSK with 50% RB allocation

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

3) 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 1) and 2) are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

4) 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.

E) 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.In this report we have check and ensure power in higher bands are equal to or higher than the lower bands for each antenna head and body with matching channel bandwidth.

8 Test Result

8.1 Measurement of RF conducted Power

The detailed conducted power can be referred to Appendix E.

Note:

1）. 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	1:4.15	1:2.77	1:2.075
Time based avg. power compared to slotted avg. power	-9.19	-6.18	-4.42	-3.17

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

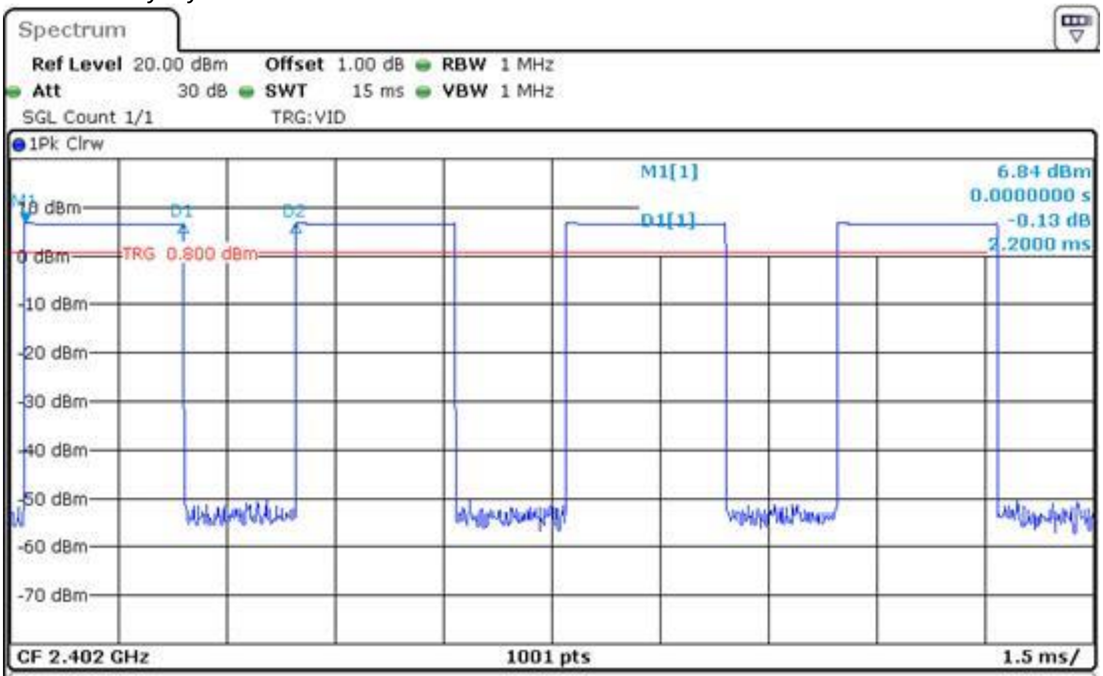
3）. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.

4）. For conducted power of WIFI must be measured at each transmit antenna port according to the DSSS and OFDM transmission configurations in each standalone and aggregated frequency band. For each transmission mode configuration, power must be measured for the highest and lowest channels; and at the mid-band channel(s) when there are at least 3 channels. For configurations with multiple mid-band channels, due to an even number of channels, both channels should be measured. Power measurement is required for the transmission mode configuration with the highest maximum output power specified for production units.

1) When the same highest maximum output power specification applies to multiple transmission modes, the largest channel bandwidth configuration with the lowest order modulation and lowest data rate is measured.

2) When the same highest maximum output power is specified for multiple largest channel bandwidth configurations with the same lowest order modulation or lowest order modulation and lowest data rate, power measurement is required for all equivalent 802.11 configurations with the same maximum output power.

5）. The conducted power of BT is measured with RMS detector.
BT DH5 Duty Cycle=2.2/3.75=58.67%



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	0.0 s	6.84 dBm		
D1	M1	1	2.2 ms	-0.13 dB		
D2	M1	1	3.75 ms	0.01 dB		

8.2 Measurement of SAR Data

Note:

1) The maximum Scaled SAR value is marked in bold. Graph results refer to Appendix B.

2) Per KDB447498 D04, 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:

- ≤ 0.8W/kg for 1-g or 2.0W/kg for 10-g respectively, when the transmission band is ≤ 100MHz.
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz.
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz.

3) The simultaneous transmission is reduced by XdB (the detailed power reduced can be referred to Conducted Power Appendix E), therefore, those SAR of simultaneous transmission mode are estimated based on standalone results.

WiFi 2.4G:

1) When the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR test for the other 802.11 modes are not required.

WiFi 5G:

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. As the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration.

2) For Wi-Fi 5G, U-NII-2A (5250-5350 MHz) and U-NII-2C (5470-5725 MHz) bands does not support hotspot function.

When the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR test for the other 802.11 modes are not required.

8.2.1 SAR Result of GSM850

Ant 1 Test Record										
Test position	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**SAR (W/kg)1-g**	**Power Drift(dB)**	**Conducted power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled 1-g SAR(W/kg)**	**Liquid Temp.(℃)**
Body Test Data(Separate 0mm)										
Back side	GPRS 4TS	190/836.6	1:2.075	0.809	0.00	28.86	29.00	1.033	0.836	22.5
Left side	GPRS 4TS	190/836.6	1:2.075	0.057	0.06	28.86	29.00	1.033	0.059	22.5
Right side	GPRS 4TS	190/836.6	1:2.075	0.340	0.09	28.86	29.00	1.033	0.351	22.5
Top side	GPRS 4TS	190/836.6	1:2.075	0.163	0.15	28.86	29.00	1.033	0.168	22.5
Bottom side	GPRS 4TS	190/836.6	1:2.075	0.441	0.12	28.86	29.00	1.033	0.455	22.5
Back side	GPRS 4TS	128/824.2	1:2.075	0.747	0.00	28.75	29.00	1.059	0.791	22.5
Back side	GPRS 4TS	251/848.8	1:2.075	0.902	0.00	28.86	29.00	1.033	**0.932**	22.5
Back side-Repeated	GPRS 4TS	251/848.8	1:2.075	0.892	0.00	28.86	29.00	1.033	0.921	22.5

Table 9： SAR of GSM850 for Body.

Test Position	**Channel/ Frequency**	**Measured SAR (1g)**	**1st Repeated**	**Ratio**	**2nd Repeated**	**3rd Repeated**
	(MHz)		**SAR (1g)**		**SAR (1g)**	**SAR (1g)**
Back side	251/848.8	0.902	0.892	1.011	N/A	N/A
Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.						
2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).						
3) A third repeated measurement was preformed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.						
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg						

8.2.2 SAR Result of GSM1900

Ant 1 Test Record										
Test position	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**SAR (W/kg)1-g**	**Power Drift(dB)**	**Conducted power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled 1-g SAR(W/kg)**	**Liquid Temp.(℃)**
Body Test Data(Separate 0mm)										
Back side	GPRS 4TS	661/1880	1:2.075	0.842	0.00	25.91	26.00	1.021	0.860	22.5
Left side	GPRS 4TS	661/1880	1:2.075	0.070	0.04	25.91	26.00	1.021	0.071	22.5
Right side	GPRS 4TS	661/1880	1:2.075	0.452	0.01	25.91	26.00	1.021	0.461	22.5
Top side	GPRS 4TS	661/1880	1:2.075	0.111	0.06	25.91	26.00	1.021	0.113	22.5
Bottom side	GPRS 4TS	661/1880	1:2.075	0.709	0.01	25.91	26.00	1.021	0.724	22.5
Back side	GPRS 4TS	512/1850.2	1:2.075	0.818	0.00	25.88	26.00	1.028	0.841	22.5
Back side	GPRS 4TS	810/1909.8	1:2.075	0.873	0.00	25.84	26.00	1.038	**0.906**	22.5
Back side-Repeated	GPRS 4TS	810/1909.8	1:2.075	0.853	0.00	25.84	26.00	1.038	0.885	22.5

Table 10： SAR of GSM1900 for Body.

Test Position	**Channel/ Frequency (MHz)**	**Measured SAR (1g)**	**1st Repeated SAR (1g)**	**Ratio**	**2nd Repeated SAR (1g)**	**3rd Repeated SAR (1g)**
Back side	810/1909.8	0.873	0.853	1.023	N/A	N/A
Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.						
2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).						
3) A third repeated measurement was preformed only if the original, first or second repeated measurement was ⩾ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.						
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg						

8.2.3 SAR Result of WCDMA Band II

Ant 1 Test Record										
Test position	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**SAR (W/kg)1-g**	**Power Drift(dB)**	**Conducted power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled 1-g SAR(W/kg)**	**Liquid Temp.(℃)**
Body Test Data((Separate 0mm)										
Back side	RMC	9400/1880	1:1	0.826	0.00	22.27	22.50	1.054	0.871	22.5
Left side	RMC	9400/1880	1:1	0.081	0.06	22.27	22.50	1.054	0.085	22.5
Right side	RMC	9400/1880	1:1	0.266	0.01	22.27	22.50	1.054	0.280	22.5
Top side	RMC	9400/1880	1:1	0.175	0.05	22.27	22.50	1.054	0.185	22.5
Bottom side	RMC	9400/1880	1:1	0.676	0.02	22.27	22.50	1.054	0.713	22.5
Back side	RMC	9262/1852.4	1:1	0.830	0.00	22.35	22.50	1.035	0.859	22.5
Back side	RMC	9538/1907.6	1:1	0.895	0.00	22.30	22.50	1.047	**0.937**	22.5
Back side-Repeated	RMC	9538/1907.6	1:1	0.876	0.00	22.30	22.50	1.047	0.917	22.5

Table 11： SAR of WCDMA Band II for Body.

Test Position	**Channel/ Frequency (MHz)**	**Measured SAR (1g)**	**1st Repeated SAR (1g)**	**Ratio**	**2nd Repeated SAR (1g)**	**3rd Repeated SAR (1g)**
Back side	9538/1907.6	0.895	0.876	1.022	N/A	N/A
Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.						
2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).						
3) A third repeated measurement was preformed only if the original, first or second repeated measurement was ⩾ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.						
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg						

8.2.4 SAR Result of WCDMA Band V

Ant 1 Test Record										
Test position	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**SAR (W/kg)1-g**	**Power Drift(dB)**	**Conducted power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled 1-g SAR(W/kg)**	**Liquid Temp.(℃)**
Body Test Data(Separate 0mm)										
Back side	RMC	4182/836.4	1:1	0.634	0.00	22.31	23.50	1.315	0.834	22.5
Left side	RMC	4182/836.4	1:1	0.001	0.11	22.31	23.50	1.315	0.001	22.5
Right side	RMC	4182/836.4	1:1	0.330	0.18	22.31	23.50	1.315	0.434	22.5
Top side	RMC	4182/836.4	1:1	0.054	0.06	22.31	23.50	1.315	0.071	22.5
Bottom side	RMC	4182/836.4	1:1	0.237	0.03	22.31	23.50	1.315	0.312	22.5
Back side	RMC	4132/826.4	1:1	0.633	0.00	22.36	23.50	1.300	0.823	22.5
Back side	RMC	4233/846.6	1:1	0.642	0.00	22.35	23.50	1.303	**0.837**	22.5

Table 12： SAR of WCDMA Band V for Body.

8.2.5 SAR Result of LTE Band 2

Ant 1 Test Record											
Test position	**BW.**	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**SAR (W/kg)1-g**	**Power Drift(dB)**	**Conducted power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled 1-g SAR(W/kg)**	**Liquid Temp.(℃)**
Body Test Data(Separate 0mm 1RB)											
Back side	20	QPSK 1_50	18700/1860	1:1	0.658	0.00	22.25	23.00	1.189	**0.782**	22.2
Left side	20	QPSK 1_50	18700/1860	1:1	0.088	0.06	22.25	23.00	1.189	0.105	22.2
Right side	20	QPSK 1_50	18700/1860	1:1	0.189	0.07	22.25	23.00	1.189	0.225	22.2
Top side	20	QPSK 1_50	18700/1860	1:1	0.113	0.15	22.25	23.00	1.189	0.134	22.2
Bottom side	20	QPSK 1_50	18700/1860	1:1	0.031	0.09	22.25	23.00	1.189	0.036	22.2
Body Test Data(Separate 0mm 50%RB)											
Back side	20	QPSK 50_25	18700/1860	1:1	0.530	0.00	21.23	22.00	1.194	0.633	22.2
Left side	20	QPSK 50_25	18700/1860	1:1	0.082	0.06	21.23	22.00	1.194	0.098	22.2
Right side	20	QPSK 50_25	18700/1860	1:1	0.144	0.02	21.23	22.00	1.194	0.172	22.2
Top side	20	QPSK 50_25	18700/1860	1:1	0.082	0.01	21.23	22.00	1.194	0.098	22.2
Bottom side	20	QPSK 50_25	18700/1860	1:1	0.025	0.09	21.23	22.00	1.194	0.029	22.2

Table 13：SAR of LTE Band 2 for Body.

8.2.6 SAR Result of LTE Band 5

Ant 1 Test Record											
Test position	**BW.**	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**SAR (W/kg)1-g**	**Power Drift(dB)**	**Conducted power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled 1-g SAR(W/kg)**	**Liquid Temp.(℃)**
Body Test Data(Separate 0mm 1RB)											
Back side	10	QPSK 1_25	20450/829	1:1	0.713	0.02	22.38	23.00	1.153	0.822	22.2
Left side	10	QPSK 1_25	20450/829	1:1	0.042	0.05	22.38	23.00	1.153	0.048	22.2
Right side	10	QPSK 1_25	20450/829	1:1	0.465	0.03	22.38	23.00	1.153	0.536	22.2
Top side	10	QPSK 1_25	20450/829	1:1	0.122	0.01	22.38	23.00	1.153	0.141	22.2
Bottom side	10	QPSK 1_25	20450/829	1:1	0.237	0.06	22.38	23.00	1.153	0.273	22.2
Back side	10	QPSK 1_25	20525/836.5	1:1	0.711	0.08	22.30	23.00	1.175	0.835	22.2
Back side	10	QPSK 1_25	20600/844	1:1	0.720	0.00	22.25	23.00	1.189	**0.856**	22.2
Body Test Data(Separate 0mm 50%RB)											
Back side	10	QPSK 25_0	20525/836.5	1:1	0.518	-0.06	21.35	22.00	1.161	0.602	22.2
Left side	10	QPSK 25_0	20525/836.5	1:1	0.001	-0.01	21.35	22.00	1.161	0.001	22.2
Right side	10	QPSK 25_0	20525/836.5	1:1	0.351	0.00	21.35	22.00	1.161	0.408	22.2
Top side	10	QPSK 25_0	20525/836.5	1:1	0.071	0.06	21.35	22.00	1.161	0.082	22.2
Bottom side	10	QPSK 25_0	20525/836.5	1:1	0.200	0.05	21.35	22.00	1.161	0.232	22.2
Body Test Data(Separate 0mm 100%RB)											
Back side	10	QPSK 50_0	20525/836.5	1:1	0.545	0.03	21.35	22.00	1.161	0.633	22.2

Table 14：SAR of LTE Band 5 for Body.

8.2.7 SAR Result of LTE Band 12

Ant 1 Test Record											
Test position	**BW.**	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**SAR (W/kg)1-g**	**Power Drift(dB)**	**Conducted power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled 1-g SAR(W/kg)**	**Liquid Temp.(℃)**
Body Test Data(Separate 0mm 1RB)											
Back side	10	QPSK 1_25	23060/704	1:1	0.759	0.00	22.48	23.00	1.127	0.856	22.2
Left side	10	QPSK 1_25	23060/704	1:1	0.003	0.03	22.48	23.00	1.127	0.003	22.2
Right side	10	QPSK 1_25	23060/704	1:1	0.482	0.00	22.48	23.00	1.127	0.543	22.2
Top side	10	QPSK 1_25	23060/704	1:1	0.064	0.05	22.48	23.00	1.127	0.072	22.2
Bottom side	10	QPSK 1_25	23060/704	1:1	0.169	0.01	22.48	23.00	1.127	0.190	22.2
Back side	10	QPSK 1_25	23095/707.5	1:1	0.720	0.06	22.40	23.00	1.148	0.827	22.2
Back side	10	QPSK 1_25	23130/711	1:1	0.752	0.09	22.39	23.00	1.151	**0.865**	22.2
Body Test Data(Separate 0mm 50%RB)											
Back side	10	QPSK 25_25	23095/707.5	1:1	0.613	0.03	21.68	22.00	1.076	0.660	22.2
Left side	10	QPSK 25_25	23095/707.5	1:1	0.001	0.15	21.68	22.00	1.076	0.001	22.2
Right side	10	QPSK 25_25	23095/707.5	1:1	0.402	0.11	21.68	22.00	1.076	0.433	22.2
Top side	10	QPSK 25_25	23095/707.5	1:1	0.045	0.04	21.68	22.00	1.076	0.048	22.2
Bottom side	10	QPSK 25_25	23095/707.5	1:1	0.134	0.07	21.68	22.00	1.076	0.144	22.2
Body Test Data(Separate 0mm 100%RB)											
Back side	10	QPSK 50_0	23095/707.5	1:1	0.598	-0.07	21.63	22.00	1.089	0.651	22.2

Table 15：SAR of LTE Band 12 for Body.

8.2.8 SAR Result of LTE Band 13

Ant 1 Test Record											
Test position	BW.	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg)1-g	Power Drift(dB)	Conducted power(dBm)	Tune up Limit(dBm)	Scaled factor	Scaled 1-g SAR(W/kg)	Liquid Temp.(℃)
Body Test Data(Separate 0mm 1RB)											
Back side	10	QPSK 1_25	23230/782	1:1	0.635	0.08	22.34	23.00	1.164	**0.739**	22.2
Left side	10	QPSK 1_25	23230/782	1:1	0.003	0.15	22.34	23.00	1.164	0.003	22.2
Right side	10	QPSK 1_25	23230/782	1:1	0.467	-0.13	22.34	23.00	1.164	0.544	22.2
Top side	10	QPSK 1_25	23230/782	1:1	0.096	0.13	22.34	23.00	1.164	0.112	22.2
Bottom side	10	QPSK 1_25	23230/782	1:1	0.223	0.11	22.34	23.00	1.164	0.260	22.2
Body Test Data(Separate 0mm 50%RB)											
Back side	10	QPSK 25_25	23230/782	1:1	0.593	0.05	21.43	22.00	1.140	0.676	22.2
Left side	10	QPSK 25_25	23230/782	1:1	0.001	0.01	21.43	22.00	1.140	0.001	22.2
Right side	10	QPSK 25_25	23230/782	1:1	0.409	0.02	21.43	22.00	1.140	0.466	22.2
Top side	10	QPSK 25_25	23230/782	1:1	0.082	0.06	21.43	22.00	1.140	0.094	22.2
Bottom side	10	QPSK 25_25	23230/782	1:1	0.163	0.08	21.43	22.00	1.140	0.186	22.2

Table 16：SAR of LTE Band 13 for Body.

8.2.9 SAR Result of LTE Band 66

Ant 1 Test Record											
Test position	**BW.**	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**SAR (W/kg)1-g**	**Power Drift(dB)**	**Conducted power (dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled 1-g SAR(W/kg)**	**Liquid Temp.(℃)**
Body Test Data(Separate 0mm 1RB)											
Back side	20	QPSK 1_50	132322/1745	1:1	0.813	0.03	21.30	21.50	1.047	0.851	22.2
Left side	20	QPSK 1_50	132322/1745	1:1	0.090	0.06	21.30	21.50	1.047	0.094	22.2
Right side	20	QPSK 1_50	132322/1745	1:1	0.062	0.05	21.30	21.50	1.047	0.065	22.2
Top side	20	QPSK 1_50	132322/1745	1:1	0.072	0.03	21.30	21.50	1.047	0.075	22.2
Bottom side	20	QPSK 1_50	132322/1745	1:1	0.360	0.01	21.30	21.50	1.047	0.377	22.2
Back side	20	QPSK 1_50	132072/1720	1:1	0.724	0.11	21.24	21.50	1.062	0.769	22.2
Back side	20	QPSK 1_50	132572/1770	1:1	0.887	0.09	21.29	21.50	1.050	**0.931**	22.2
Back side-Repeated	20	QPSK 1_50	132572/1770	1:1	0.879	0.09	21.29	21.50	1.050	0.923	22.2
Body Test Data(Separate 0mm 50%RB)											
Back side	20	QPSK 50_50	132072/1720	1:1	0.495	-0.13	20.35	20.50	1.035	0.512	22.2
Left side	20	QPSK 50_50	132072/1720	1:1	0.077	0.06	20.35	20.50	1.035	0.080	22.2
Right side	20	QPSK 50_50	132072/1720	1:1	0.042	0.07	20.35	20.50	1.035	0.043	22.2
Top side	20	QPSK 50_50	132072/1720	1:1	0.071	0.05	20.35	20.50	1.035	0.073	22.2
Bottom side	20	QPSK 50_50	132072/1720	1:1	0.335	0.01	20.35	20.50	1.035	0.347	22.2
Body Test Data(Separate 0mm 100%RB)											
Back side	20	QPSK 100_0	132322/1745	1:1	0.566	-0.06	20.28	20.50	1.052	0.595	22.2

Table 17：SAR of LTE Band 66 for Body.

Test Position	**Channel/ Frequency**	**Measured SAR (1g)**	**1st Repeated**	**Ratio**	**2nd Repeated**	**3rd Repeated**
	(MHz)		**SAR (1g)**		**SAR (1g)**	**SAR (1g)**
Back side	132572/1770	0.887	0.879	1.009	N/A	N/A
Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.						
2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).						
3) A third repeated measurement was preformed only if the original, first or second repeated measurement was ⩾ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.						
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg						

8.2.10 SAR Result of WIFI 2.4G

Ant 3 Test Record											
Test position	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**Duty Cycle**	**SAR (W/kg)1-g**	**Power Drift(dB)**	**Conducted power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled 1-g SAR(W/kg)**	**Liquid Temp.(℃)**
Body Test Data(Separate 0mm)											
Back side	802.11b	6/2437	99.52%	1.005	0.209	0.02	12.32	13.00	1.000	**0.210**	22.5
Left side	802.11b	6/2437	99.52%	1.005	0.028	0.11	12.32	13.00	1.000	0.028	22.5
Rightt side	802.11b	6/2437	99.52%	1.005	0.029	0.15	12.32	13.00	1.000	0.029	22.5
Top side	802.11b	6/2437	99.52%	1.005	0.125	0.03	12.32	13.00	1.000	0.126	22.5
Bottom side	802.11b	6/2437	99.52%	1.005	0.001	0.04	12.32	13.00	1.000	0.001	22.5

Table 18：SAR of WIFI 2.4G for Body.

Note:

1) As the 802.11b highest reported SAR is smaller than 1.2 W/kg, and the tune-up of the other 802.11 modes is not higher than 802.11b, therefore the adjusted SAR is ≤ 1.2 W/kg for other 802.11 modes, SAR test for the other 802.11 modes is not required.

8.2.11 SAR Result of WIFI 5G

Ant3 Test Record											
Test position	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**Duty Cycle**	**SAR (W/kg)1-g**	**Power Drift(dB)**	**Conducted power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled 1-g SAR(W/kg)**	**Liquid Temp.(℃)**
Body Test Data(Separate 0mm)											
Back side	802.11a	40/5200	96.53%	1.036	0.129	0.05	6.27	7.00	1.183	0.158	22.5
Left side	802.11a	40/5200	96.53%	1.036	0.082	0.01	6.27	7.00	1.183	0.100	22.5
Right side	802.11a	40/5200	96.53%	1.036	0.081	0.11	6.27	7.00	1.183	0.099	22.5
Top side	802.11a	40/5200	96.53%	1.036	0.105	0.02	6.27	7.00	1.183	0.129	22.5
Bottom side	802.11a	40/5200	96.53%	1.036	0.097	0.03	6.27	7.00	1.183	0.119	22.5
Body Test Data(Separate 0mm)											
Back side	802.11a	157/5785	96.53%	1.036	0.431	0.09	9.32	9.50	1.042	**0.465**	22.5
Left side	802.11a	157/5785	96.53%	1.036	0.090	0.06	9.32	9.50	1.042	0.097	22.5
Right side	802.11a	157/5785	96.53%	1.036	0.070	0.02	9.32	9.50	1.042	0.076	22.5
Top side	802.11a	157/5785	96.53%	1.036	0.108	0.10	9.32	9.50	1.042	0.117	22.5
Bottom side	802.11a	157/5785	96.53%	1.036	0.082	0.06	9.32	9.50	1.042	0.089	22.5

Table 19：SAR of WIFI 5G for Body.

Note:
1) As the above highest 1g reported SAR is smaller than 1.2 W/kg, and the tune-up of the other 802.11 modes are not higher than the SAR test mode above, therefore the adjusted SAR is ≤ 1.2 W/kg for other 802.11 modes, SAR test for the other 802.11 modes is not required.

8.2.12 SAR Result of BT

Ant3 Test Record											
Test position	**Test mode**	**Test ch./Freq.**	**Duty Cycle**	**Duty Cycle**	**SAR (W/kg)1-g**	**Power Drift(dB)**	**Conducted power(dBm)**	**Tune up Limit(dBm)**	**Scaled factor**	**Scaled 1-g SAR(W/kg)**	**Liquid Temp.(℃)**
Body Test Data (Separate 0mm)											
Back side	DH5	39/2441	58.67%	1.704	0.103	-0.05	8.24	8.50	1.062	**0.186**	22.3
Left side	DH5	39/2441	58.67%	1.704	0.009	-0.05	8.24	8.50	1.062	0.016	22.3
Rightt side	DH5	39/2441	58.67%	1.704	0.007	-0.05	8.24	8.50	1.062	0.013	22.3
Top side	DH5	39/2441	58.67%	1.704	0.010	-0.05	8.24	8.50	1.062	0.018	22.3
Bottom side	DH5	39/2441	58.67%	1.704	0.003	-0.05	8.24	8.50	1.062	0.005	22.3

Table 20：SAR of BT for Body.

8.3 Multiple Transmitter Evaluation

8.3.1Simultaneous SAR SAR test evaluation

- **Simultaneous Transmission Possibilities**

No.	Simultaneous Tx Combination	Body
1.	WWAN + WLAN 2.4GHz	Yes
2.	WWAN + WLAN 5GHz	Yes
3.	WWAN + BT	Yes
4.	WLAN 5GHz + BT	Yes

Note:

1) The device does not support DTM function.

8.3.2 Simultaneous Transmission SAR Summation Scenario

Body 0mm:

Test position		SARmax (W/kg)				Summed SAR			
		Main Ant0	WiFi 2.4G	WiFi 5G	BT				
		1	2	3	4	1+2	1+3	1+4	3+4
GSM850	Back side	0.932	0.210	0.465	0.186	1.142	1.397	1.118	0.651
	Left side	0.059	0.028	0.100	0.016	0.087	0.159	0.075	0.116
	Right side	0.351	0.000	0.099	0.000	0.351	0.450	0.351	0.099
	Top side	0.168	0.126	0.129	0.018	0.294	0.297	0.186	0.147
	Bottom side	0.455	0.001	0.119	0.005	0.456	0.574	0.460	0.124
GSM1900	Back side	0.906	0.210	0.465	0.186	1.116	1.371	1.092	0.651
	Left side	0.071	0.028	0.100	0.016	0.099	0.171	0.087	0.116
	Right side	0.461	0.000	0.099	0.000	0.461	0.560	0.461	0.099
	Top side	0.113	0.126	0.129	0.018	0.239	0.242	0.131	0.147
	Bottom side	0.724	0.001	0.119	0.005	0.725	0.843	0.729	0.124
WCDMA Band2	Back side	0.937	0.210	0.465	0.186	1.147	**1.402**	1.123	0.651
	Left side	0.085	0.028	0.100	0.016	0.113	0.185	0.101	0.116
	Right side	0.280	0.000	0.099	0.000	0.280	0.379	0.280	0.099
	Top side	0.185	0.126	0.129	0.018	0.311	0.314	0.203	0.147
	Bottom side	0.713	0.001	0.119	0.005	0.714	0.832	0.718	0.124
WCDMA Band5	Back side	0.837	0.210	0.465	0.186	1.047	1.302	1.023	0.651
	Left side	0.001	0.028	0.100	0.016	0.029	0.101	0.017	0.116
	Right side	0.434	0.000	0.099	0.000	0.434	0.533	0.434	0.099
	Top side	0.071	0.126	0.129	0.018	0.197	0.200	0.089	0.147
	Bottom side	0.312	0.001	0.119	0.005	0.313	0.431	0.317	0.124
LTE Band2	Back side	0.782	0.210	0.465	0.186	0.992	1.247	0.968	0.651
	Left side	0.105	0.028	0.100	0.016	0.133	0.205	0.121	0.116
	Right side	0.225	0.000	0.099	0.000	0.225	0.324	0.225	0.099
	Top side	0.134	0.126	0.129	0.018	0.260	0.263	0.152	0.147
	Bottom side	0.036	0.001	0.119	0.005	0.037	0.155	0.041	0.124
LTE Band5	Back side	0.856	0.210	0.465	0.186	1.066	1.321	1.042	0.651
	Left side	0.048	0.028	0.100	0.016	0.076	0.148	0.064	0.116
	Right side	0.536	0.000	0.099	0.000	0.536	0.635	0.536	0.099
	Top side	0.141	0.126	0.129	0.018	0.267	0.270	0.159	0.147
	Bottom side	0.273	0.001	0.119	0.005	0.274	0.392	0.278	0.124
LTE Band12	Back side	0.865	0.210	0.465	0.186	1.075	1.330	1.051	0.651
	Left side	0.003	0.028	0.100	0.016	0.031	0.103	0.019	0.116
	Right side	0.543	0.000	0.099	0.000	0.543	0.642	0.543	0.099
	Top side	0.072	0.126	0.129	0.018	0.198	0.201	0.090	0.147
	Bottom side	0.190	0.001	0.119	0.005	0.191	0.309	0.195	0.124
LTE Band13	Back side	0.739	0.210	0.465	0.186	0.949	1.204	0.925	0.651
	Left side	0.003	0.028	0.100	0.016	0.031	0.103	0.019	0.116
	Right side	0.544	0.000	0.099	0.000	0.544	0.643	0.544	0.099
	Top side	0.112	0.126	0.129	0.018	0.238	0.241	0.130	0.147
	Bottom side	0.260	0.001	0.119	0.005	0.261	0.379	0.265	0.124
LTE Band66	Back side	0.931	0.210	0.465	0.186	1.141	1.396	1.117	0.651
	Left side	0.094	0.028	0.100	0.016	0.122	0.194	0.110	0.116
	Right side	0.065	0.000	0.099	0.000	0.065	0.164	0.065	0.099
	Top side	0.075	0.126	0.129	0.018	0.201	0.204	0.093	0.147
	Bottom side	0.377	0.001	0.119	0.005	0.378	0.496	0.382	0.124

9 Equipment list

Test Platform	SPEAG DASY Professional					
Description	SAR Test System (Frequency range 300MHz-6GHz)					
Software Reference	DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)					
Hardware Reference						
	Equipment	Manufacturer	Model	Serial Number	Calibration Date	Due date of calibration
☒	Twin Phantom	SPEAG	SAM 3	2031	NCR	NCR
☒	DAE	SPEAG	DAE4	1663	2023/03/27	2024/03/26
☒	E-Field Probe	SPEAG	EX3DV4	7838	2023/09/11	2024/09/10
☒	Validation Kits	SPEAG	D750V3	1160	2022/06/06	2025/06/05
☒	Validation Kits	SPEAG	D835V2	4d105	2022/11/02	2025/11/01
☒	Validation Kits	SPEAG	D1750V2	1149	2022/06/17	2025/06/16
☒	Validation Kits	SPEAG	D1900V2	5d028	2022/11/02	2025/11/01
☒	Validation Kits	SPEAG	D2450V2	733	2022/11/02	2025/11/01
☒	Validation Kits	SPEAG	D5GHzV2	1165	2022/11/01	2025/10/31
☒	Dielectric parameter probes	SPEAG	DAKS-3.5	0005	2023/06/15	2024/06/14
☒	Vector Network Analyzer and Vector Reflectometer	SPEAG	DAKS_VNA R140	0140913	2023/06/07	2024/06/06
☒	Radio Communication Analyzer	Anritsu	MT8820C	6201616273	2024/01/30	2025/01/29
☒	Radio Communication Analyzer	Anritsu	MT8820C	6201381734	2023/05/25	2024/05/24
☒	Radio Communication Analyzer	Anritsu	MT8820C	6201074424	2023/09/14	2024/09/13
☒	RF Bi-Directional Coupler	Agilent	86205-60001	MY31400031	NCR	NCR
☒	Signal Generator	Agilent	N5171B	MY53050736	2024/01/30	2025/01/29
☒	Preamplifier	Mini-Circuits	ZHL-42W	15542	NCR	NCR
☒	Preamplifier	Compliance Directions Systems Inc.	AMP28-3W	073501433	NCR	NCR
☒	Power Meter	Agilent	E4416A	GB41292095	2024/01/30	2025/01/29
☒	Power Sensor	Agilent	8481H	MY41091234	2024/01/30	2025/01/29
☒	Power Sensor	R&S	NRP-Z92	100025	2024/01/30	2025/01/29
☒	Attenuator	SHX	TS2-3dB	30704	NCR	NCR
☒	Humidity and Temperature Indicator	MingGao	TH101B	NA	2024/01/31	2025/01/30
☒	Speed reading thermometer	MingGao	T809	NA	2023/05/26	2024/05/25
☒	Humidity and Temperature Indicator	CHIGAO	HTC-1	ZGL2020120550458	2023/05/26	2024/05/25

☒	Humidity and Temperature Indicator	CHIGAO	HTC-1	ZGL2020120550471	2023/05/26	2024/05/25
☒	Humidity and Temperature Indicator	CHIGAO	HTC-1	ZGL2020120550472	2023/05/26	2024/05/25

Note: All the equipments are within the valid period when the tests are performed.

10 Calibration certificate

Please see the Appendix C

11 Photographs

Please see the Appendix D

Appendix A: Detailed System Check Results

Appendix B: Detailed Test Results

Appendix C: Calibration certificate

Appendix D: Photographs

Appendix E: Conducted RF Output Power

Appendix F: Antenna Locations

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