Registration
No.788871

TEST REPORT
FOR SAR TESTING

Report No.: SRTC2018-9004(F)-18042301(H)

Product Name: Mobile Phone

Product Model: Hisense U965

Applicant: Hisense International Co., Ltd.

Manufacturer: Hisense Communications Co., Ltd.

Specification: FCC Part 2.1093

IEEE Std 1528-2013

FCC RF Exposure KDB Procedures

FCC ID: 2ADOBU965

The State Radio_monitoring_center Testing Center (SRTC)

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1. GENERAL INFORMATION

1.1 Notes of the test report

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written permission of The State Radio_monitoring_center Testing Center (SRTC).
The test results relate only to individual items of the samples which have been tested.

1.2 Information about the testing laboratory

Company:	The State Radio_monitoring_center Testing Center (SRTC)
Address:	15th Building, No.30 Shixing Street, Shijingshan District, Beijing P.R.China
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1.3 Applicant's details

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1.4 Manufacturer's details

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1.5 Test Environment

Date of Receipt of test sample at SRTC:	2018.04.23
Testing Start Date:	2018.04.24
Testing End Date:	2018.05.11

Environmental Data:	Temperature (°C)	Humidity (%)
Ambient	21.0-22.0	35.0-45.0

Normal Supply Voltage (V d.c.):	3.8

2. DESCRIPTION OF THE DEVICE UNDER TEST

2.1 Final Equipment Build Status

Wireless Technology and Frequency Bands	☒GSM Band: GSM850/PCS1900 ☒WCDMA Band: FDD2/5 ☐LTE Band ☒Bluetooth Band: 2.4GHz ☒Wi-Fi Band: 2.4GHz
Mode	GSM ☒Voice (GMSK) ☒GPRS (GMSK) ☒EGPRS (GMSK) WCDMA ☒UMTS Rel. 99 (Voice & Data) ☒HSDPA (Rel. 5) ☒HSUPA (Rel. 6) ☒HSPA+ (Rel.) ☒DC-HSDPA (Rel.) Wi-Fi (802.11a/b/g/n) ☐802.11a ☒802.11b ☒802.11g ☒802.11n (20MHz) ☐802.11n (40MHz) ☐802.11ac (20MHz) ☐802.11ac (40MHz) ☐802.11ac (80MHz) Bluetooth ☒BR(GFSK) ☒EDR(π/4 DQPSK , 8-DPSK) ☐BLE(GFSK) LTE ☐QPSK ☐16QAM ☐64QAM
Duty Cycle	GSM Voice: 12.5%; GPRS: 12.5% (1 Slot), 25% (2 Slots), 37.5% (3 Slots), 50% (4 Slots) WCDMA: 100% Wi-Fi 802.11b/g/n: 100% Bluetooth: 32.25% (DH1), 66.68% (DH3), 77.52% (DH5)
GPRS Multi-Slot Class	☐Class 8 - One Up ☐Class 10 - Two Up ☒Class 12 - Four Up
Mobile Phone Capability	☐Class A - Mobile phones can be connected to both GPRS and GSM services simultaneously. ☒Class B - Mobile phones can be attached to both GPRS and GSM services, using one service at a time. ☐Class C - Mobile phones are attached to either GPRS or GSM voice service. You need to switch manually between services
DTM (Dual Transfer Mode)	Not Supported

2.2 Support Equipment

The following support equipment was used to exercise the DUT during testing:

State of sample	Normal
Headset	B1G513A07/Shenzhen Jinchuangju Electronic Technology Co.,Ltd.
Batteries	LIW38210A/Guangdong Teamgiant New Energy Tech Co.,LTD
H/W Version S/W Version	YK737_V3.0 Hisense_U965_10_S03_20180602
IMEI	86769031290622
Notes	As the information described above, we use test sample offered by the customer. The relevant tests have been performed in order to verify in which combination case the EUT would have the worst features.

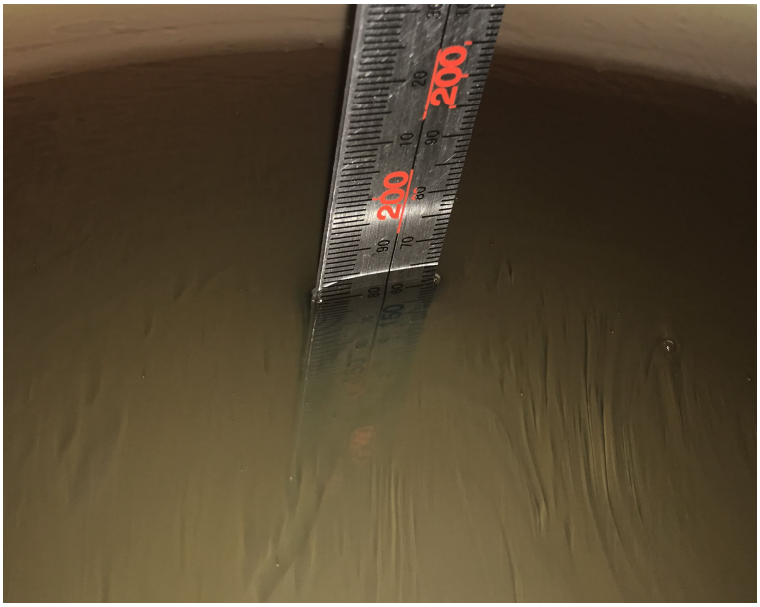
3. REFERENCE SPECIFICATION

Specification	Version	Title
Part 2.1093	2018	Radiofrequency radiation exposure evaluation: portable devices.
IEEE Std 1528	2013	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
IEEE Std 1528a	2005	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques Amendment 1: CAD File for Human Head Model (SAM Phantom)
KDB 447498 D01	v06	General RF Exposure Guidance
KDB 648474 D04	v01r03	Handset SAR
KDB 941225 D01	v03r01	3G SAR Procedures
KDB 941225 D06	v02r01	Hotspot Mode
KDB 248227 D01	v02r02	SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS
KDB 865664 D01	v01r04	SAR Measurement from 100 MHz to 6 GHz
KDB 865664 D02	v01r02	RF Exposure Reporting
KDB 941225 D05	v02r05	SAR for LTE Devices

4. TEST CONDITIONS

4.1 Picture to demonstrate the required liquid depth

The liquid depth in the used SAM phantoms



Liquid depth for SAR Measurement

4.2 Test Signal, Frequencies and Output Power

The device was put into operation by using a call tester. Communication between the device and the call tester was established by air link.
The device output power was set to maximum power level for all tests; a fully charged battery was used for every test sequence.
In all operating bands the measurements were performed on middle channel, and few of them were also performed on lowest and highest channels.

4.3 SAR Measurement Set-up

The system is based on a high precision robot (working range greater than 0.9m), which positions the probes with a positional repeatability of better than ± 0.02mm. Special E-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines (length =300mm) to the data acquisition unit. A cell controller system contains the power supply, robot controller, teaches pendant (Joystick), and remote control, is used to drive the robot motors.

The PC consists of the Micron Pentium IV computer with Win7 system and SAR Measurement Software DASY5 Professional, A/D interface card, monitor, mouse, and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot.
A data acquisition electronic (DAE) circuit performs the signal amplification; signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card. The DAE consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines.
The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection
The robot uses its own controller with a built in VME-bus computer.

4.4 Phantoms

The phantom used for all tests i.e. for both system checks and device testing, was the twin headed "SAM Phantom", manufactured by SPEAG. The phantom conforms to the requirements of IEEE 1528 - 2013.
System checking was performed using the flat section, whilst Head SAR tests used the left and right head profile sections. Body SAR testing also used the flat section between the head profiles.
The SPEAG device holder (see Section 5.1) was used to position the device in all tests whilst a tripod was used to position the validation dipoles against the flat section of phantom.

4.5 Tissue Simulants

Recommended values for the dielectric parameters of the tissue simulants are given in IEEE 1528 - 2013 and FCC Supplement C to OET Bulletin 65. All tests were carried out using simulants whose dielectric parameters were within ± 5% of the recommended values. All tests were carried out within 24 hours of measuring the dielectric parameters.
The depth of the tissue simulant was 15.0 ± 0.5 cm measured from the ear reference point during system checking and device measurements.

4.5.1 Tissue Stimulant Recipes

The following tissue stimulants were used for Head and Body test:

Name	Broadband tissue-equivalent liquid
Type for Head	HBBL600-6000V6 Head Simulating Liquid
Type for Body	MBBL600-6000V6 Body Simulating Liquid

4.6 DESCRIPTION OF THE TEST PROCEDURE

4.6.1 Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the Dasy5 system.

Device holder supplied by SPEAG

4.6.2 Test positions

4.6.2.1 Against Phantom Head

Measurements were made in “cheek” and “tilt” positions on both the left hand and right hand sides of the phantom.
The positions used in the measurements were according to IEEE 1528 - 2013 "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques".

4.6.2.2 Body Worn Configuration

The device was placed in the SPEAG holder below the flat section of the phantom. The distance between the device and the phantom was kept at the separation distance using a separate flat spacer that was removed before the start of the measurements. And the distance is 10mm.The device was oriented with its antenna facing the phantom since this orientation gives higher results.

4.6.3 Scan Procedure

First, area scans were used for determination of the field distribution and the approximate location of the local peak SAR values. The SAR distribution is scanned along the inside surface, at least for an area larger than the projection of the handset and antenna. The angle between the probe axis and the surface normal line is recommended but not required to be less than 30°. The SAR distribution is first measured on a 2-D coarse grid. The scan region should cover all areas that are exposed and encompassed by the projection of the handset. There are 15 mm × 15 mm (equal or less than 2GHz), 12 mm × 12 mm (from 2GHz~3GHz) and 10mm x 10mm (above 5GHz) measurement grid used when two staggered one-dimensional cubic splines are used to estimate the maximum SAR location. Next, a zoom scan, a minimum of 7 x 7x7 points covering a volume of at least 30x30x30mm, was performed around the highest E-field value to determine the averaged SAR value. Drift was determined by measuring the same point at the start of the area scan and again at the end of the zoom scan.

4.6.4 SAR Averaging Methods

The maximum SAR value was averaged over a cube of tissue using interpolation and extrapolation.
The interpolation, extrapolation and maximum search routines within DASY5 are all based on the modified Quadratic Shepard’s method (Robert J. Renka,”Multivariate Interpolation of Large Sets of Scattered Data”, University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148).
The interpolation scheme combines a least-square fitted function method with a weighted average method. A trivariate 3-D / bivariate 2-D quadratic function is computed for each measurement point and fitted to neighbouring points by a least-square method. For the zoom scan, inverse distance weighting is incorporated to fit distant points more accurately. The interpolating function is finally calculated as a weighted average of the quadratics.
In the zoom scan, the interpolation function is used to extrapolate the Peak SAR from the deepest measurement points to the inner surface of the phantom.

5 RESULT SUMMAR

The maximum reported SAR values for Head configuration and Body Worn configuration are given as follows. The device conforms to the requirements of the standard(s) when the maximum reported SAR value is less than or equal to the limit.

Exposure Posltion	Frequency Band	1g-SAR Reported Result (W/kg)	Highest 1g-SAR Reported Result (W/kg)		Limit (W/kg)/1g	Result
Head	GSM 850	0.278	0.278	0.744	1.60	pass
	GSM 1900	0.151				
	WCDMA Band 2	0.235				
	WCDMA Band 5	0.188				
	WLAN 2.4GHz Band	0.049				
Body (10mm Gap)	GSM 850	0.744	0.744			
	GSM 1900	0.576				
	WCDMA Band 2	0.449				
	WCDMA Band 5	0.461				
	WLAN 2.4GHz Band	0.135				

Simultaneous Transmission Summary

Exposure Position	Frequency Band	1g-SAR Result(W/kg)	Highest 1g-SAR Result(W/kg)		Limit (W/kg) /1g	Result
Head	GSM & Wi-Fi	0.323	0.344	0.877	1.60	pass
	WCDMA & Wi-Fi	0.284				
	GSM & Bluetooth	0.344				
	WCDMA & Bluetooth	0.301				
Body (10mm Gap)	GSM & Wi-Fi	0.877	0.877			
	WCDMA & Wi-Fi	0.594				
	GSM & Bluetooth	0.777				
	WCDMA & Bluetooth	0.494				

This Test Report Is Issued by: Mr. Peng Zhen 彭振	Checked by: Mr. Li Bin 李彬
Tested by: Mr. Chang Tianyu 常天宇	Issued date: 20180620

6 TEST RESULT

6.1 Manufacturing Tolerance

GSM

GSM 850			
Channel	Channel 128	Channel 189	Channel 251
Tolerance (dBm)	29.0~33.0	29.0~33.0	29.0~33.0
GSM 1900			
Channel	Channel 512	Channel 661	Channel 810
Tolerance (dBm)	26.0~30.0	26.0~30.0	26.0~30.0

GSM 850 GPRS				
Channel		128	189	251
1 Txslot	Tolerance (dBm)	29.0~33.0	29.0~33.0	29.0~33.0
2 Txslot	Tolerance (dBm)	**28.0~32.0**	**28.0~32.0**	**28.0~32.0**
3 Txslot	Tolerance (dBm)	26.0~30.0	26.0~30.0	26.0~30.0
4 Txslot	Tolerance (dBm)	25.0~29.0	25.0~29.0	25.0~29.0
GSM 850 EGPRS (GMSK)				
Channel		128	189	251
1 Txslot	Tolerance (dBm)	29.0~33.0	29.0~33.0	29.0~33.0
2 Txslot	Tolerance (dBm)	28.5~32.5	28.5~32.5	28.5~32.5
3 Txslot	Tolerance (dBm)	**27.0~31.0**	**27.0~31.0**	**27.0~31.0**
4 Txslot	Tolerance (dBm)	26.0~30.0	26.0~30.0	26.0~30.0

GSM 1900 GPRS				
Channel		512	661	810
1 Txslot	Tolerance (dBm)	26.0~30.0	26.0~30.0	26.0~30.0
2 Txslot	Tolerance (dBm)	**25.0~29.0**	**25.0~29.0**	**25.0~29.0**
3 Txslot	Tolerance (dBm)	24.0~28.0	24.0~28.0	24.0~28.0
4 Txslot	Tolerance (dBm)	23.0~27.0	23.0~27.0	23.0~27.0
GSM 1900 EGPRS (GMSK)				
Channel		512	661	810
1 Txslot	Tolerance (dBm)	26.0~30.0	26.0~30.0	26.0~30.0
2 Txslot	Tolerance (dBm)	25.5~29.5	25.5~29.5	25.5~29.5
3 Txslot	Tolerance (dBm)	**24.0~28.0**	**24.0~28.0**	**24.0~28.0**
4 Txslot	Tolerance (dBm)	23.0~27.0	23.0~27.0	23.0~27.0

WCDMA

WCDMA Band2			
Channel	9262	9400	9538
Tolerance (dBm)	19.0~23.0	19.0~23.0	19.0~23.0
WCDMA Band5			
Channel	4132	4183	4233
Tolerance (dBm)	19.0~23.0	19.0~23.0	19.0~23.0

HSDPA Band2				
Channel		9262	9400	9538
Sub test 1	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0
Sub test 2	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0
Sub test 3	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0
Sub test 4	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0
HSDPA Band5				
Channel		4132	4183	4233
Sub test 1	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0
Sub test 2	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0
Sub test 3	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0
Sub test 4	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0

HSUPA Band2				
Channel		9262	9400	9538
Sub test 1	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0
Sub test 2	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0
Sub test 3	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0
Sub test 4	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0
Sub test 5	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0

HSUPA Band5				
Channel		4132	4183	4233
Sub test 1	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0
Sub test 2	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0
Sub test 3	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0
Sub test 4	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0
Sub test 5	Tolerance (dBm)	18.0~22.0	18.0~22.0	18.0~22.0

Bluetooth

GFSK			
Channel	0	39	78
Tolerance (dBm)	-2.0~2.0	-2.0~2.0	-2.0~2.0
π/4DQPSK			
Channel	0	39	78
Tolerance (dBm)	-4.5~-0.5	-4.5~-0.5	-4.5~-0.5
8DPSK			
Channel	0	39	78
Tolerance (dBm)	-4.5~-0.5	-4.5~-0.5	-4.5~-0.5

Wi-Fi (2.4GHz)

802.11b			
Channel	1	6	11
Tolerance (dBm)	12.5~16.5	12.5~16.5	12.5~16.5
802.11g			
Channel	1	6	11
Tolerance (dBm)	11.0~15.0	11.0~15.0	11.0~15.0
802.11n HT20			
Channel	1	6	11
Tolerance (dBm)	11.0~15.0	11.0~15.0	11.0~15.0

6.2 GSM Measurement result

GSM Measured Power

Mode	GSM850			GSM1900		
Channel	128	189	251	512	661	810
Frequency(MHz)	824.2	836.4	848.8	1850.2	1880.0	1909.8
Measured Power(dBm)	32.77	32.86	32.78	29.74	29.82	29.73

GPRS Measured Power

Mode	GPRS850			GPRS1900		
Channel	128	189	251	512	661	810
Frequency(MHz)	824.2	836.4	848.8	1850.2	1880.0	1909.8
4Downlink1uplinkPower(dBm)	32.75	32.88	32.77	29.84	29.88	29.83
3Downlink2uplinkPower(dBm)	**31.72**	**31.84**	**31.73**	**28.67**	**28.69**	**28.75**
2Downlink3uplinkPower(dBm)	29.79	29.75	29.54	27.68	27.73	27.57
1Downlink4uplinkPower(dBm)	28.48	28.57	28.36	26.32	26.56	26.36

GPRS Averaged Power

Mode	GPRS850			GPRS1900		
Channel	128	189	251	512	661	810
Frequency(MHz)	824.2	836.4	848.8	1850.2	1880.0	1909.8
4Downlink1uplinkPower(dBm)	23.72	23.85	23.74	20.81	20.85	20.80
3Downlink2uplinkPower(dBm)	**25.70**	**25.82**	**25.71**	**22.65**	**22.67**	**22.73**
2Downlink3uplinkPower(dBm)	25.53	25.49	25.28	23.42	23.47	23.31
1Downlink4uplinkPower(dBm)	25.47	25.56	25.35	23.31	23.55	23.35

Division Factors (for Measured Power and Averaged Power):
To average the power, the division factor is as follows:
1TX-slot (4Downlink1uplink) = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB
2TX-slots(3Downlink2uplink) = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB
3TX-slots (2Downlink3uplink)= 3 transmit time slots out of 8 time slots=> conducted power divided by (8/3) => -4.26dB
4TX-slots (1Downlink4uplink)= 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.01dB
According to the conducted power as above, the body measurements are performed with **2Txslots** (3Downlink2uplink) for GPRS.

EGPRS Measured Power

Mode	EGPRS850 (GMSK)			EGPRS1900 (GMSK)		
	EGPRS850 (8PSK)			EGPRS1900 (8PSK)		
Channel	128	189	251	512	661	810
Frequency(MHz)	824.2	836.4	848.8	1850.2	1880.0	1909.8
4Downlink1uplinkPower(dBm)	32.86	32.87	32.92	29.78	29.80	29.76
	---	---	---	---	---	---
3Downlink2uplinkPower(dBm)	32.00	31.87	31.74	29.08	28.68	28.75
	---	---	---	---	---	---
2Downlink3uplinkPower(dBm)	**30.55**	**30.49**	**30.43**	**27.69**	**27.54**	**27.58**
	---	---	---	---	---	---
1Downlink4uplinkPower(dBm)	29.36	29.20	29.13	26.32	26.21	26.36
	---	---	---	---	---	---

EGPRS Averaged Power

Mode	EGPRS850 (GMSK)			EGPRS1900 (GMSK)		
	EGPRS850 (8PSK)			EGPRS1900 (8PSK)		
Channel	128	189	251	512	661	810
Frequency(MHz)	824.2	836.4	848.8	1850.2	1880.0	1909.8
4Downlink1uplinkPower(dBm)	23.83	23.84	23.89	20.75	20.77	20.73
	---	---	---	---	---	---
3Downlink2uplinkPower(dBm)	25.98	25.85	25.72	23.06	22.66	22.73
	---	---	---	---	---	---
2Downlink3uplinkPower(dBm)	**26.29**	**26.23**	**26.17**	**23.43**	**23.28**	**23.32**
	---	---	---	---	---	---
1Downlink4uplinkPower(dBm)	26.35	26.19	26.12	23.31	23.20	23.35
	---	---	---	---	---	---

Division Factors (for Measured Power and Averaged Power):
To average the power, the division factor is as follows:
1TX-slot (4Downlink1uplink) = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB
2TX-slots(3Downlink2uplink) = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB
3TX-slots (2Downlink3uplink) = 3 transmit time slots out of 8 time slots=> conducted power divided by (8/3) => -4.26dB
4TX-slots (1Downlink4uplink) = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.01dB
According to the conducted power as above, the body measurements are performed with **3Txslots** (2Downlink3uplink) for EGPRS (GMSK).

6.3 WCDMA Measurement result

The following procedures are according to FCC KDB Publication 941225 D01.
Release 99
The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc/βd	8/15

Measured Results

Mode	Band2			Band5		
Channel	9262	9400	9538	4132	4183	4233
Frequency(MHz)	1852.4	1880	1907.6	826.4	836.4	846.6
RB test mode1+64kRMC(dBm)	22.62	22.72	22.66	22.72	22.73	22.72
RB test mode1+12.2kRMC(dBm)	**22.68**	**22.74**	**22.69**	**22.78**	**22.83**	**22.79**
RB test mode1+144kRMC(dBm)	22.62	22.69	22.65	22.75	22.82	22.80
RB test mode1+384kRMC(dBm)	22.58	22.64	22.59	22.79	22.82	22.73
AMR Voice test mode+ 12.2kRMC	22.62	22.73	22.62	22.74	22.83	22.75

HSDPA
The following 4 Sub-tests were completed according to Release 5 procedures in section 5.2 of 3GPP TS34.121.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}(1)	CM(dB) (2)
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15(3)	15/15(3)	64	12/15(3)	24/15	1.0
3	15/15	8/15	64	15/18	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

Note1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} =8⇔$A_{hs}=\beta_{hs}/\beta_c$=30/15⇔$\beta_{hs}$=30/15*$\beta_c$.
Note2:CM=1 for β_c/β_d=12/15, β_{hs}/β_c=24/15.
Note3:For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period(TF1,TF0) is achieved by setting the signaled gain factors for the reference TFC(TF1,TF1) to β_c=11/15 and β_d=15/15.

Measured Results

Mode	HSDPA Band 2			HSDPA Band 5		
Channel	9262	9400	9538	4132	4183	4233
Frequency(MHz)	1852.4	1880	1907.6	826.4	836.4	846.6
sub-test1(dBm)	21.30	21.40	21.30	21.70	21.70	21.70
sub-test2(dBm)	21.20	21.20	21.30	21.70	21.80	21.80
sub-test3(dBm)	21.40	21.30	21.20	21.10	21.30	21.30
sub-test4(dBm)	21.40	21.30	21.40	21.30	21.30	21.30

HSPA (HSDPA & HSUPA)

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}(1)	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM(2) (dB)	MPR (dB)	AG(4) Index	E-TFCI
1	11/15 (3)	15/15 (3)	64	11/15 (3)	22/15	209/225	1039/225	4	1	1.0	2.0	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	2.0	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	2.0	21	81

Note1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} =8⇔$A_{hs}=\beta_{hs}/\beta_c$=30/15⇔$\beta_{hs}$=30/15*$\beta_c$.
Note2: CM=1 for β_c/β_d =12/15,β_{hs}/β_c=24/15.For all other combinations of DPDCH,DPCCH,HS-DPCCH,E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period(TF1,TF0) is achieved by setting the signaled gain factors for the reference TFC(TF1,TF1) to β_c=10/15 and β_d=15/15.
Note4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period(TF1,TF0) is achieved by setting the signaled gain factors for the reference TFC(TF1,TF1) to β_c=14/15 and β_d=15/15.
NOTE5: Testing UE using E-DPDCH Physical layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.
NOTE6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Measured Results

Mode	HSUPA Band 2			HSUPA Band 5		
Channel	9262	9400	9538	4132	4183	4233
Frequency(MHz)	1852.4	1880	1907.6	826.4	836.4	846.6
sub-test1(dBm)	19.90	20.00	19.50	20.20	20.30	20.30
sub-test2(dBm)	19.90	20.00	19.40	20.30	20.30	20.50
sub-test3(dBm)	19.80	20.00	19.70	20.00	20.10	20.10
sub-test4(dBm)	19.40	19.40	19.00	20.10	20.10	20.20
sub-test5(dBm)	20.80	20.80	20.80	20.60	20.70	20.70

Note: UMTS SAR was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01.HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.

6.4 Bluetooth Measurement result

Modulation type	Test Result (dBm)		
	2402MHz(Ch0)	2441MHz(Ch39)	2480MHz(Ch78)
GFSK	1.82	1.58	0.73
π/4DQPSK	-0.76	-1.01	-1.88
8DPSK	-0.78	-1.03	-1.89

6.5 Wi-Fi Measurement result

WIFI 2.4G

Modulation type		Average power output (dBm)		
		2412MHz	2437MHz	2462MHz
11b	1 Mbps	15.74	16.09	16.17
	2 Mbps	15.81	16.07	16.16
	5.5 Mbps	15.85	16.05	16.16
	11 Mbps	15.94	16.02	16.15
11g	6 Mbps	14.64	14.89	14.88
	9 Mbps	14.29	14.54	14.54
	12 Mbps	13.94	14.18	14.21
	18 Mbps	13.59	13.83	13.87
	24 Mbps	13.24	13.48	13.54
	36 Mbps	12.89	13.13	13.20
	48 Mbps	12.54	12.77	12.87
	54 Mbps	12.19	12.42	12.53
11n HT20	6.5 Mbps	14.72	14.88	15.06
	13 Mbps	14.22	14.38	14.55
	19.5 Mbps	13.71	13.87	14.05
	26 Mbps	13.21	13.37	13.54
	39 Mbps	12.70	12.87	13.03
	52 Mbps	12.20	12.37	12.52
	58.5 Mbps	11.69	11.86	12.02
	65 Mbps	11.19	11.36	11.51

6.6 Standalone SAR Test Exclusion Considerations

Standalone 1-g head or body SAR evaluation by measurement or numerical simulation is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

According to the KDB447498 4.3.1 (1)

For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f (GHz)] ≤ 3.0 for 1-g SAR, where

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

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

This is equivalent to [(max. power of channel, including tune-up tolerance, mW)/(60/√f(GHz) mW)]·[20 mm/(min.test separation distance, mm)] ≤ 1.0 for 1-g SAR; also see Appendix A for approximate exclusion threshold values at selected frequencies and distances.
According to the KDB447498 appendix A

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	*SAR Test Exclusion Threshold* (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

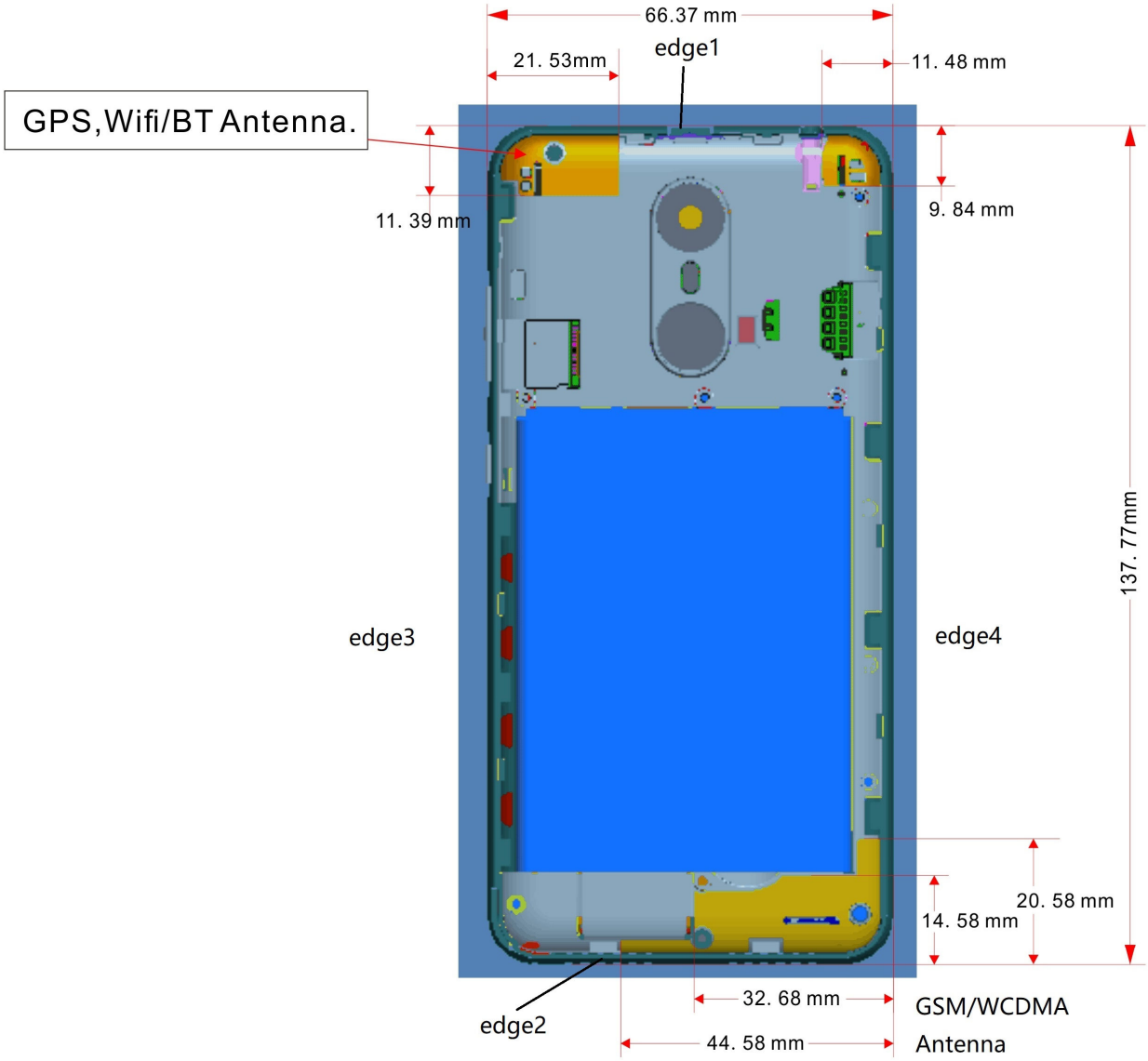
Summary of Transmitters

Band/Mode	Position	Max.RF output power (mW)	SAR test exclusion Threshold (mW)	SAR Required
(2.4~2.4835)GHz Bluetooth	Head	1.82	10	No
	Body	1.82	19	No
(2.4~2.4835)GHz Wifi	Head	16.17	10	Yes
	Body	16.17	19	No*

Note*: For WIFI 2.4GHz, the body SAR satisfy the exclusion criteria, but we also test Body SAR in order the result could be reasonable and reliable other than evaluated SAR just in body position.

6.7 RF exposure conditions

Refer to the follow picture “Antenna Locations & Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.



6.7.1 Head Exposure Conditions

For WWAN

Test Configurations	SAR Required	Note
Left Touch	yes	/
Left Tilt (15°)	yes	/
Right Touch	yes	/
Right Tilt (15°)	yes	/

For WLAN

Test Configurations	SAR Required	Note
Left Touch	yes	/
Left Tilt (15°)	yes	/
Right Touch	yes	/
Right Tilt (15°)	yes	/

6.7.2 Body Exposure conditions

For WWAN

Test Configurations	SAR Required	Note
Rear	yes	/
Front	yes	/

For WLAN

Test Configurations	SAR Required	Note
Rear	yes	/
Front	yes	/

6.7.3 Hotspot Exposure Conditions

For WWAN

Test Configurations	Antenna-to-edge/surface	SAR Required
Rear	<25 mm	Yes
Front	<25 mm	Yes
Edge 1	>25 mm	No
Edge 2	>25 mm	Yes
Edge 3	>25 mm	Yes
Edge 4	>25 mm	Yes

For WLAN

Test Configurations	Antenna-to-edge/surface	SAR Required
Rear	<25 mm	Yes
Front	<25 mm	Yes
Edge 1	<25 mm	Yes
Edge 2	>25 mm	No
Edge 3	<25 mm	Yes
Edge 4	>25 mm	No

Note: For hotspot mode, it's not necessary test Rear and Front position cause we already test the these position without hotspot mode in Body Exposure conditions ,Normally if the hotspot mode opened, the technology" power reduction" used for mobile, so we consider the worst condition.

6.8 System Checking

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulants were measured every day using the dielectric probe kit and the network analyser. A system check measurement was made following the determination of the dielectric parameters of the simulant, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system checking results (dielectric parameters and SAR values) are given in the table below.

Date Tested	System dipole	T.S. Liquid	SAR measured (normalized to 1W)		Target (Ref.Value)	Delta (%)	Tolerance (%)
2018/4/24	D835V2	Head	1g	9.16	9.37	-2.24	±10
2018/4/26	D1800V2	Head	1g	37.84	38.90	-2.72	±10
2018/4/28	D2450V2	Head	1g	51.20	52.40	-2.29	±10

Date Tested	System dipole	T.S. Liquid	SAR measured (normalized to 1W)		Target (Ref.Value)	Delta (%)	Tolerance (%)
2018/5/02	D835V2	Body	1g	9.12	9.47	-2.67	±10
2018/5/04	D1800V2	Body	1g	38.68	39.00	-0.82	±10
2018/5/08	D2450V2	Body	1g	53.20	52.30	1.72	±10

Plots of the system checking scans are given in Appendix A.
Tissue Simulants used in the Measurements
For the measurement of the following parameters the SPEAG DAKS-3.5 dielectric parameter probe is used, representing the open-ended coaxial probe measurement procedure.

Date Tested	Freq.(MHz)	Liquid parameters	measured	Target	Delta(%)	Tolerance(%)
2018/4/24	Head 835	εr	41.114	41.50	-0.93	±5
		σ[S/m]	0.915	0.90	1.67	±5
2018/4/26	Head 1800	εr	40.607	40.00	1.52	±5
		σ[S/m]	1.411	1.40	0.79	±5
2018/4/28	Head 2450	εr	39.583	39.20	0.98	±5
		σ[S/m]	1.833	1.80	1.83	±5

Date Tested	Freq.(MHz)	Liquid parameters	measured	Target	Delta(%)	Tolerance(%)
2018/5/02	Body 835	εr	56.196	55.20	1.80	±5
		σ[S/m]	0.966	0.97	-0.41	±5
2018/5/04	Body 1800	εr	51.717	53.30	-2.97	±5
		σ[S/m]	1.542	1.52	1.45	±5
2018/5/08	Body 2450	εr	51.046	52.70	-3.14	±5
		σ[S/m]	2.027	1.95	3.95	±5

6.9 SAR TEST RESULT

In order to determine the largest value of the peak spatial-average SAR of a handset, all device positions, configurations, and operational modes should be tested for each frequency band according to Steps 1 to 3 below.

Step 1: The tests should be performed at the channel that is closest to the center of the transmit frequency band.
a) All device positions (cheek and tilt, for both left and right sides of the SAM phantom),
b) All configurations for each device position in a), e.g., antenna extended and retracted, and
c) All operational modes for each device position in item a) and configuration in item b) in each frequency band, e.g., analog and digital, If more than three frequencies need to be tested (i.e., Nc > 3), then all frequencies, configurations and modes shall be tested for all of the above test conditions.
Step 2: For the condition providing the highest peak spatial-average SAR determined in Step 1 for each frequency, perform all tests at all other test frequency channels, e.g., lowest and highest frequencies. In addition, for all other conditions (device position, configuration, and operational mode) where the peak spatial-average SAR value determined in Step 1 is within 3 dB of the applicable SAR limit, it is recommended that all other test frequencies should be tested as well.
Step 3: Examine all data to determine the largest value of the peak.
Note:
1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
Scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
Reported SAR (W/kg) = Measured SAR (W/kg)* Scaling Factor
2. Per KDB 447498 D01v06, for each exposure position, if the highest output channel reported SAR ≤0.8W/kg, other channels SAR testing are not necessary.
3. In the report the test position “Mobile phone screen Towards Ground” abbreviated as “TG”, and “Mobile phone screen Towards Phantom” abbreviated as “TP”.
4. The distance between the EUT and the phantom bottom is 10mm.

The measured and reported Head/body SAR values for the test device are tabulated below:

Mode: GSM 850

fL(MHz)=824.2MHz fM(MHz)=836.5MHz fH(MHz)= 848.8MHz

SAR Values(Head , 850MHz Band)

Limit of SAR (W/kg) : <1.6W/kg (1g Average)

Test Case		Ch	Measure Conducted Power (dBm)	Tune-up limit (dBm)	Scaling Factor	Measure Results (W/kg)	Reported Results (W/kg)
position	mode					1g Average	1g Average
Left cheek	GSM	L	32.77	33.00	1.05	---	---
		M	32.86	33.00	1.03	0.266	0.274
		H	32.78	33.00	1.05	---	---
Left Tilted		L	32.77	33.00	1.05	---	---
		M	32.86	33.00	1.03	0.142	0.146
		H	32.78	33.00	1.05	---	---
Right cheek		L	32.77	33.00	1.05	0.247	0.259
		M	32.86	33.00	1.03	0.270	0.278
		H	32.78	33.00	1.05	0.244	0.256
Right Tilted		L	32.77	33.00	1.05	---	---
		M	32.86	33.00	1.03	0.153	0.158
		H	32.78	33.00	1.05	---	---

Mode: GSM850 (GSM/GPRS)
fL (MHz)=824.2MHz fM (MHz)=836.5MHz fH (MHz)= 848.8MHz
SAR Values(Body, 850MHz Band)
Limit of SAR (W/kg) : <1.6W/kg (1g Average)

Test Case		Ch	Measure Conducted Power (dBm)	Tune-up limit (dBm)	Scaling Factor	Measure Results (W/kg)	Reported Results (W/kg)
position	mode					1g Average	1g Average
TG	GSM With headset	L	32.77	33.00	1.05	---	---
		M	32.86	33.00	1.03	0.209	0.215
		H	32.78	33.00	1.05	---	---
	GPRS	L	31.72	32.00	1.07	0.551	0.590
		M	31.84	32.00	1.04	0.677	0.704
		H	31.73	32.00	1.06	0.605	0.641
	EGPRS	L	30.55	31.00	1.11	---	---
		M	30.49	31.00	1.12	0.664	0.744
		H	30.43	31.00	1.14	---	---
TP	GSM With headset	L	32.77	33.00	1.05	---	---
		M	32.86	33.00	1.03	0.143	0.147
		H	32.78	33.00	1.05	---	---
	GPRS	L	31.72	32.00	1.07	---	---
		M	31.84	32.00	1.04	0.410	0.426
		H	31.73	32.00	1.06	---	---
	EGPRS	L	30.55	31.00	1.11	---	---
		M	30.49	31.00	1.12	0.410	0.459
		H	30.43	31.00	1.14	---	---
Hotspot EDGE 2	GPRS	L	31.72	32.00	1.07	---	---
		M	31.84	32.00	1.04	0.149	0.155
		H	31.73	32.00	1.06	---	---
Hotspot EDGE 3		L	31.72	32.00	1.07	---	---
		M	31.84	32.00	1.04	0.388	0.404
		H	31.73	32.00	1.06	---	---
Hotspot EDGE 4		L	31.72	32.00	1.07	---	---
		M	31.84	32.00	1.04	0.437	0.454
		H	31.73	32.00	1.06	---	---

Mode: GSM1900

fL (MHz)=1850.2MHz fM (MHz)=1880.0MHz fH (MHz)=1909.8MHz

SAR Values (Head, 1900MHz Band)

Limit of SAR (W/kg) : <1.6W/kg (1g Average)

Test Case		CH	Measure Conducted Power (dBm)	Tune-up limit (dBm)	Scaling Factor	Measure Results (W/kg)	Reported Results (W/kg)
position	mode					1g Average	1g Average
Left cheek	GSM	L	29.74	30.00	1.06	---	---
		M	29.82	30.00	1.04	0.145	0.151
		H	29.73	30.00	1.06	---	---
Left Tilted		L	29.74	30.00	1.06	---	---
		M	29.82	30.00	1.04	0.048	0.050
		H	29.73	30.00	1.06	---	---
Right cheek		L	29.74	30.00	1.06	---	---
		M	29.82	30.00	1.04	0.087	0.090
		H	29.73	30.00	1.06	---	---
Right Tilted		L	29.74	30.00	1.06	---	---
		M	29.82	30.00	1.04	0.062	0.064
		H	29.73	30.00	1.06	---	---

Mode: GSM1900 (GSM/GPRS/EGPRS)
fL (MHz)=1850.2MHz fM (MHz)=1880.0MHz fH (MHz)=1909.8MHz
SAR Values (body, 1900MHz Band)
Limit of SAR (W/kg) :< 1.6W/kg (1g Average)

Test Case		CH	Measure Conducted Power (dBm)	Tune-up limit (dBm)	Scaling Factor	Measure Results (W/kg)	Reported Results (W/kg)
position	mode					1g Average	1g Average
TG	GSM With headset	L	29.74	30.00	1.06	---	---
		M	29.82	30.00	1.04	0.175	0.182
		H	29.73	30.00	1.06	---	---
	GPRS	L	28.67	29.00	1.08	---	---
		M	28.69	29.00	1.07	0.220	0.235
		H	28.75	29.00	1.06	---	---
	EGPRS	L	27.69	28.00	1.07	---	---
		M	27.54	28.00	1.11	0.282	0.313
		H	27.58	28.00	1.10	---	---
TP	GSM With headset	L	29.74	30.00	1.06	---	---
		M	29.82	30.00	1.04	0.157	0.163
		H	29.73	30.00	1.06	---	---
	GPRS	L	28.67	29.00	1.08	---	---
		M	28.69	29.00	1.07	0.221	0.236
		H	28.75	29.00	1.06	---	---
	EGPRS	L	27.69	28.00	1.07	---	---
		M	27.54	28.00	1.11	0.287	0.319
		H	27.58	28.00	1.10	---	---
Hotspot EDGE 2	EGPRS	L	27.69	28.00	1.07	---	---
		M	27.54	28.00	1.11	0.519	0.576
		H	27.58	28.00	1.10	---	---
Hotspot EDGE 3		L	27.69	28.00	1.07	---	---
		M	27.54	28.00	1.11	0.076	0.085
		H	27.58	28.00	1.10	---	---
Hotspot EDGE 4		L	27.69	28.00	1.07	---	---
		M	27.54	28.00	1.11	0.122	0.135
		H	27.58	28.00	1.10	---	---

.

Mode: WCDMA BAND2

fL (MHz)=1852.4MHz fM (MHz)=1880MHz fH (MHz)= 1907.6MHz

SAR Values (Head, WCDMA BAND2)

Limit of SAR (W/kg) :< 1.6W/kg (1g Average)

Test Case		CH	Measure Conducted Power (dBm)	Tune-up limit (dBm)	Scaling Factor	Measure Results (W/kg)	Reported Results (W/kg)
position	mode					1g Average	1g Average
Left cheek	VOICE	L	22.68	23.00	1.08	---	---
		M	22.74	23.00	1.06	0.222	0.235
		H	22.69	23.00	1.07	---	---
Left Tilted		L	22.68	23.00	1.08	---	---
		M	22.74	23.00	1.06	0.065	0.069
		H	22.69	23.00	1.07	---	---
Right cheek		L	22.68	23.00	1.08	---	---
		M	22.74	23.00	1.06	0.125	0.133
		H	22.69	23.00	1.07	---	---
Right Tilted		L	22.68	23.00	1.08	---	---
		M	22.74	23.00	1.06	0.077	0.082
		H	22.69	23.00	1.07	---	---

Mode: WCDMA BAND2

fL (MHz)=1852.4MHz fM (MHz)=1880MHz fH (MHz)= 1907.6MHz

SAR Values (Body, WCDMA BAND2)

Limit of SAR (W/kg) :< 1.6W/kg (1g Average)

Test Case		CH	Measure Conducted Power (dBm)	Tune-up limit (dBm)	Scaling Factor	Measure Results (W/kg)	Reported Results (W/kg)
Position	mode					1g Average	1g Average
TG	VOICE	L	22.68	23.00	1.08	---	---
		M	22.74	23.00	1.06	0.243	0.258
		H	22.69	23.00	1.07	---	---
	DATA	L	22.68	23.00	1.08	---	---
		M	22.74	23.00	1.06	0.233	0.247
		H	22.69	23.00	1.07	---	---
TP	VOICE	L	22.68	23.00	1.08	---	---
		M	22.74	23.00	1.06	0.112	0.119
		H	22.69	23.00	1.07	---	---
	DATA	L	22.68	23.00	1.08	---	---
		M	22.74	23.00	1.06	0.113	0.120
		H	22.69	23.00	1.07	---	---
Hotspot EDGE2	VOICE	H	22.68	23.00	1.08	---	---
		L	22.74	23.00	1.06	0.424	0.449
		M	22.69	23.00	1.07	---	---
Hotspot EDGE3		H	22.68	23.00	1.08	---	---
		L	22.74	23.00	1.06	0.137	0.145
		M	22.69	23.00	1.07	---	---
Hotspot EDGE4		H	22.68	23.00	1.08	---	---
		L	22.74	23.00	1.06	0.218	0.231
		M	22.69	23.00	1.07	---	---

Mode: WCDMA BAND5

fL (MHz)=826.4MHz fM (MHz)=836.4MHz fH (MHz)= 846.6MHz

SAR Values(Head, WCDMA BAND5)

Limit of SAR (W/kg) : <1.6W/kg (1g Average)

Test Case		CH	Measure Conducted Power (dBm)	Tune-up limit (dBm)	Scaling Factor	Measure Results (W/kg)	Reported Results (W/kg)
Position	mode					1g Average	1g Average
Left cheek	VOICE	L	22.78	23.00	1.05	---	---
		M	22.83	23.00	1.04	0.181	0.188
		H	22.79	23.00	1.05	---	---
Left Tilted		L	22.78	23.00	1.05	---	---
		M	22.83	23.00	1.04	0.078	0.081
		H	22.79	23.00	1.05	---	---
Right cheek		L	22.78	23.00	1.05	---	---
		M	22.83	23.00	1.04	0.174	0.181
		H	22.79	23.00	1.05	---	---
Right Tilted		L	22.78	23.00	1.05	---	---
		M	22.83	23.00	1.04	0.072	0.075
		H	22.79	23.00	1.05	---	---

Mode: WCDMA BAND5

fL (MHz)=826.4MHz fM (MHz)=836.4MHz fH (MHz)= 846.6MHz

SAR Values(body, WCDMA BAND5)

Limit of SAR (W/kg) : <1.6W/kg (1g Average)

Test Case		CH	Measure Conducted Power (dBm)	Tune-up limit (dBm)	Scaling Factor	Measure Results (W/kg)	Reported Results (W/kg)
Position	mode					1g Average	1g Average
TG	VOICE	L	22.78	23.00	1.05	---	---
		M	22.83	23.00	1.04	0.430	0.447
		H	22.79	23.00	1.05	---	---
	DATA	L	22.78	23.00	1.05	---	---
		M	22.83	23.00	1.04	0.443	0.461
		H	22.79	23.00	1.05	---	---
TP	VOICE	L	22.78	23.00	1.05	---	---
		M	22.83	23.00	1.04	0.312	0.324
		H	22.79	23.00	1.05	---	---
	DATA	L	22.78	23.00	1.05	---	---
		M	22.83	23.00	1.04	0.311	0.323
		H	22.79	23.00	1.05	---	---
Hotspot EDGE2	DATA	L	22.78	23.00	1.05	---	---
		M	22.83	23.00	1.04	0.147	0.153
		H	22.79	23.00	1.05	---	---
Hotspot EDGE3		L	22.78	23.00	1.05	---	---
		M	22.83	23.00	1.04	0.103	0.107
		H	22.79	23.00	1.05	---	---
Hotspot EDGE4		L	22.78	23.00	1.05	---	---
		M	22.83	23.00	1.04	0.103	0.107
		H	22.79	23.00	1.05	---	---

Mode: Wi-Fi 2.4GHz

fL (MHz)=2412MHz fM (MHz)=2437MHz fH (MHz)= 2462MHz

SAR Values (Wi-Fi 802.11b)

Limit of SAR (W/kg) : <1.6W/kg (1g Average)

Test Case		CH	Measure Conducted Power (dBm)	Tune-uplimit (dBm)	Scaling Factor	Measure Results (W/kg)	Reported Results (W/kg)
Position	mode					1g Average	1g Average
Left cheek	802.11b	L	15.74	16.50	1.19	---	---
		M	16.09	16.50	1.10	0.045	0.049
		H	16.17	16.50	1.08	---	---
Left Tilted		L	15.74	16.50	1.19	---	---
		M	16.09	16.50	1.10	0.023	0.025
		H	16.17	16.50	1.08	---	---
Right cheek		L	15.74	16.50	1.19	---	---
		M	16.09	16.50	1.10	0.023	0.025
		H	16.17	16.50	1.08	---	---
Right Tilted		L	15.74	16.50	1.19	---	---
		M	16.09	16.50	1.10	0.028	0.031
		H	16.17	16.50	1.08	---	---

Test Case		CH	Measure Conducted Power (dBm)	Tune-up limit (dBm)	Scaling Factor	Measure Results (W/kg)	Reported Results (W/kg)
Position	mode					1g Average	1g Average
TG	802.11b	L	15.74	16.50	1.19	---	---
		M	16.09	16.50	1.10	0.121	0.133
		H	16.17	16.50	1.08	---	---
TP		L	15.74	16.50	1.19	---	---
		M	16.09	16.50	1.10	0.123	0.135
		H	16.17	16.50	1.08	---	---
Hotspot EDGE1		L	15.74	16.50	1.19	---	---
		M	16.09	16.50	1.10	0.006	0.006
		H	16.17	16.50	1.08	---	---
Hotspot EDGE4		L	15.74	16.50	1.19	---	---
		M	16.09	16.50	1.10	0.008	0.009
		H	16.17	16.50	1.08	---	---

6.10 SAR Measurement Variability

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. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.
The following procedures are applied to determine if repeated measurements are required.
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 Highest Reported SAR configuration in Each Frequency Band

Frequency band	Air interface	Head(w/kg)	Body(w/kg)
850 MHz	GSM850 WCDMA band5	<0.8	<0.8
1800/1900 MHz	GSM1900 WCDMA band2	<0.8	<0.8
2.4 GHz	WIFI 2.4G	<0.8	<0.8

6.11 Simultaneous Transmission SAR Analysis

The sum of SAR values for GSM & WiFi

	MAXIMUM SAR VALUE FOR HEAD	MAXIMUM SAR VALUE FOR BODY
GSM	0.274	0.744
WiFi	0.049	0.133
Sum	0.323	0.877
Note	GSM850+WIFI 2.4G Left cheek	GSM 850+WIFI 2.4G TG

According to the above tables, the sum of SAR values for GSM and WiFi < 1.6W/kg. So simultaneous transmission SAR are not required for WiFi transmitter.

The sum of SAR values for WCDMA & WiFi

	MAXIMUM SAR VALUE FOR HEAD	MAXIMUM SAR VALUE FOR BODY
WCDMA	0.235	0.461
WiFi	0.049	0.133
Sum	0.284	0.594
Note	WCDMA BAND2+WIFI 2.4G Left cheek	WCDMA BAND5+WIFI TG

According to the above tables, the sum of SAR values for WCDMA and WiFi < 1.6W/kg. So simultaneous transmission SAR are not required for WiFi transmitter.

According to the formula (KDB447498 4.3.2) the Bluetooth SAR as follow:
[(max.power of channel, including tune-up tolerance,mw)/(min.test separation distance,mm)]
[√f(GHz)/x] W/kg for test separation distances≦50mm.
Head:
min. test separation distance = 5mm
Body:
min. test separation distance = 10mm
Where x=7.5 for 1-g SAR, and x=18.75 for 10-g SAR.

Eestimated SAR Bluetooth

Mode	Position	F(GHz)	Distance(mm)	Estimated
Bluetooth	Head	2.402	5	0.066
	Body	2.402	10	0.033

The sum of SAR values for GSM & Bluetooth

	MAXIMUM SAR VALUE FOR HEAD	MAXIMUM SAR VALUE FOR BODY
GSM	0.278	0.744
Bluetooth	0.066	0.033
Sum	0.344	0.777
Note	GSM850+BT Right cheek	GSM 850+BT TG

According to the above tables, the sum of SAR values for GSM and Bluetooth ＜1.6W/kg. So simultaneous transmission SAR are not required for Bluetooth transmitter.

The sum of SAR values for WCDMA & Bluetooth

	MAXIMUM SAR VALUE FOR HEAD	MAXIMUM SAR VALUE FOR BODY
WCDMA	0.235	0.461
Bluetooth	0.066	0.033
Sum	0.301	0.494
Note	WCDMA BAND2+BT Left cheek	WCDMA BAND5+BT EDGE2

According to the above tables, the sum of SAR values for WCDMA and Bluetooth ＜1.6W/kg. So simultaneous transmission SAR are not required for Bluetooth transmitter.

7 MEASUREMENT UNCERTAINTY

(0.3 - 3 GHz range)								
Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±6.0 %	N	1	1	1	±6.0 %	±6.0 %	∞
Axial Isotropy	±4.7 %	R	$\sqrt{3}$	0.7	0.7	±1.9 %	±1.9 %	∞
Hemispherical Isotropy	±9.6 %	R	$\sqrt{3}$	0.7	0.7	±3.9 %	±3.9 %	∞
Boundary Effects	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %	∞
Linearity	±4.7 %	R	$\sqrt{3}$	1	1	±2.7 %	±2.7 %	∞
System Detection Limits	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %	∞
Modulation Response^m	±2.4 %	R	$\sqrt{3}$	1	1	±1.4 %	±1.4 %	∞
Readout Electronics	±0.3 %	N	1	1	1	±0.3 %	±0.3 %	∞
Response Time	±0.8 %	R	$\sqrt{3}$	1	1	±0.5 %	±0.5 %	∞
Integration Time	±2.6 %	R	$\sqrt{3}$	1	1	±1.5 %	±1.5 %	∞
RF Ambient Noise	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
RF Ambient Reflections	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
Probe Positioner	±0.4 %	R	$\sqrt{3}$	1	1	±0.2 %	±0.2 %	∞
Probe Positioning	±2.9 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
Max. SAR Eval.	±2.0 %	R	$\sqrt{3}$	1	1	±1.2 %	±1.2 %	∞
Test Sample Related								
Device Positioning	±2.9 %	N	1	1	1	±2.9 %	±2.9 %	145
Device Holder	±3.6 %	N	1	1	1	±3.6 %	±3.6 %	5
Power Drift	±5.0 %	R	$\sqrt{3}$	1	1	±2.9 %	±2.9 %	∞
Power Scaling^p	±0 %	R	$\sqrt{3}$	1	1	±0.0 %	±0.0 %	∞
Phantom and Setup								
Phantom Uncertainty	±6.1 %	R	$\sqrt{3}$	1	1	±3.5 %	±3.5 %	∞
SAR correction	±1.9 %	R	$\sqrt{3}$	1	0.84	±1.1 %	±0.9 %	∞
Liquid Conductivity (mea.)^{DAK}	±2.5 %	R	$\sqrt{3}$	0.78	0.71	±1.1 %	±1.0 %	∞
Liquid Permittivity (mea.) ^{DAK}	±2.5 %	R	$\sqrt{3}$	0.26	0.26	±0.3 %	±0.4 %	∞
Temp. unc. - Conductivity ^{BB}	±3.4 %	R	$\sqrt{3}$	0.78	0.71	±1.5 %	±1.4 %	∞
Temp. unc. - Permittivity ^{BB}	±0.4 %	R	$\sqrt{3}$	0.23	0.26	±0.1 %	±0.1 %	∞
Combined Std. Uncertainty						±11.2 %	±11.1 %	361
Expanded STD Uncertainty						**±22.3 %**	**±22.2 %**	

(3 - 6 GHz range)								
Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±6.55 %	N	1	1	1	±6.55 %	±6.55 %	∞
Axial Isotropy	±4.7 %	R	$\sqrt{3}$	0.7	0.7	±1.9 %	±1.9 %	∞
Hemispherical Isotropy	±9.6 %	R	$\sqrt{3}$	0.7	0.7	±3.9 %	±3.9 %	∞
Boundary Effects	±2.0 %	R	$\sqrt{3}$	1	1	±1.2 %	±1.2 %	∞
Linearity	±4.7 %	R	$\sqrt{3}$	1	1	±2.7 %	±2.7 %	∞
System Detection Limits	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %	∞
Modulation Response^m	±2.4 %	R	$\sqrt{3}$	1	1	±1.4 %	±1.4 %	∞
Readout Electronics	±0.3 %	N	1	1	1	±0.3 %	±0.3 %	∞
Response Time	±0.8 %	R	$\sqrt{3}$	1	1	±0.5 %	±0.5 %	∞
Integration Time	±2.6 %	R	$\sqrt{3}$	1	1	±1.5 %	±1.5 %	∞
RF Ambient Noise	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
RF Ambient Reflections	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
Probe Positioner	±0.8 %	R	$\sqrt{3}$	1	1	±0.5 %	±0.5 %	∞
Probe Positioning	±6.7 %	R	$\sqrt{3}$	1	1	±3.9 %	±3.9 %	∞
Max. SAR Eval.	±4.0 %	R	$\sqrt{3}$	1	1	±2.3 %	±2.3 %	∞
Test Sample Related								
Device Positioning	±2.9 %	N	1	1	1	±2.9 %	±2.9 %	145
Device Holder	±3.6 %	N	1	1	1	±3.6 %	±3.6 %	5
Power Drift	±5.0 %	R	$\sqrt{3}$	1	1	±2.9 %	±2.9 %	∞
Power Scaling^p	±0 %	R	$\sqrt{3}$	1	1	±0.0 %	±0.0 %	∞
Phantom and Setup								
Phantom Uncertainty	±6.6 %	R	$\sqrt{3}$	1	1	±3.8 %	±3.8 %	∞
SAR correction	±1.9 %	R	$\sqrt{3}$	1	0.84	±1.1 %	±0.9 %	∞
Liquid Conductivity (mea.)^{DAK}	±2.5 %	R	$\sqrt{3}$	0.78	0.71	±1.1 %	±1.0 %	∞
Liquid Permittivity (mea.) ^{DAK}	±2.5 %	R	$\sqrt{3}$	0.26	0.26	±0.3 %	±0.4 %	∞
Temp. unc. - Conductivity ^{BB}	±3.4 %	R	$\sqrt{3}$	0.78	0.71	±1.5 %	±1.4 %	∞
Temp. unc. - Permittivity ^{BB}	±0.4 %	R	$\sqrt{3}$	0.23	0.26	±0.1 %	±0.1 %	∞
Combined Std. Uncertainty						±12.3 %	±12.2 %	748
Expanded STD Uncertainty						**±24.6 %**	**±24.5 %**	

8 TEST EQUIPMENTS

The measurements were performed using an automated near-field scanning system, DASY5, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland. The SAR extrapolation algorithm used in all measurements was the 'advanced extrapolation' algorithm.

The following table lists calibration dates of SPEAG components:

Test Equipment	Model	Serial Number	Calibration date	Calibration Due data
DAE	DAE4	546	2017.09.15	2018.09.14
Dosimetric E-field Probe	EX3DV4	3127	2017.10.13	2018.10.12
Dipole Validation Kit	D835V2	4d023	2017.09.13	2018.09.12
Dipole Validation Kit	D1800V2	2d084	2017.09.15	2018.09.14
Dipole Validation Kit	D2450V2	738	2017.09.18	2018.09.17

Additional test equipment used in testing:

Test Equipment	Model	Serial Number	Calibration date	Calibration Due data
Signal Generator	E4428C	MY45280865	2017.08.20	2018.08.19
Signal Generator	SML 03	103514	2017.08.20	2018.08.19
Power meter	E4417A	MY45101182	2017.08.20	2018.08.19
Power Sensor	E4412A	MY41502214	2017.08.20	2018.08.19
Power Sensor	E4412A	MY41502130	2017.08.20	2018.08.19
Power meter	E4417A	MY45101004	2017.08.20	2018.08.19
Power Sensor	E9300B	MY41496001	2017.08.20	2018.08.19
Power Sensor	E9300B	MY41496003	2017.08.20	2018.08.19
Communication Tester	8960	GB43194054	2017.08.20	2018.08.19
Vector Network Analyzer	VNA R140	0011213	2017.10.17	2018.10.16
Dielectric Parameter Probe	DAKS-3.5	1042	2017.10.17	2018.10.16

Detailed information of Isotropic E-field Probe Type ES3DV3

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Calibration certificate in Appendix C
Frequency	10 MHz to 4 GHz; Linearity: ± 0.2 dB (30 MHz to 4 GHz)
Optical Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm
Dynamic Range	5 μW/g to > 100 W/kg; Linearity: ± 0.2 dB
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones

Detailed information of Isotropic E-field Probe Type EX3DV4

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Calibration certificate in Appendix C
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Optical Surface Detection	± 0.3 mm repeatability in air and clear liquids over diffuse reflecting surfaces
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
Dynamic Range	10 μW/g to > 100 W/kg Linearity: ± 0.2 dB (noise: typically < 1 μW/g)
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%.

ANNEX A – TEST PLOTS

Please refer to the attachment.

ANNEX B – RELEVANT PAGES FROM CALIBRATION REPORTS

Please refer to the attachment.