FCC SAR Compliance Test Report

Product Name: Smart Phone

Model: DRA-L01

Report No.: SYBH(Z-SAR) 20180212006002-2

FCC ID: QISDRA-L01

	APPROVED (Lab Manager)	PREPARED (Test Engineer)
BY	Wei Huanbin	Luo Hua
DATE	2018-05-07	2018-05-07

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※ ※ Notice ※ ※

1. The laboratory has passed the accreditation by China National Accreditation Service for Conformity Assessment (CNAS). The accreditation number is L0310.

2. The laboratory has passed the accreditation by The American Association for Laboratory Accreditation (A2LA). The accreditation number is 2174.01 & 2174.02 & 2174.03

3. The laboratory (Reliability Lab of Huawei Technologies Co., Ltd) is also named “Global Compliance and Testing Center of Huawei Technologies Co., Ltd”, the both names have coexisted since 2009.

4. The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

5. The test report is invalid if there is any evidence of erasure and/or falsification.

6. The test report is only valid for the test samples.

7. Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

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HUAWEI

※ ※ Modified History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	2018-05-07	Luo Hua

1 General Information

1.1 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for DRA-L01 are as below Table 1.

Band	Max Reported SAR(W/kg)		
	1-g Head	**1-g Body-worn (15mm) ***	**1-g Hotspot (10mm)**
GSM850	0.36	0.68	**0.57**
GSM1900	0.18	0.26	0.38
UMTS Band 5	0.42	0.57	0.49
LTE Band 5	**0.43**	0.46	0.55
LTE Band 7	0.17	**1.03**	0.54
WiFi 2.4G	0.31	0.15	0.28
BT	/	/	/
The highest reported SAR for Head, Body Worn, Hotspot and Simultaneous transmission exposure conditions are 0.43 W/kg, 1.03 W/kg, 0.57 W/kg, 1.19 W/kg per KDB690783 D01.			

Table 1:Summary of test result

Note:

1)* For body worn operation, this device has been tested and meets FCC RF exposure guidelines when used with any accessory that contains no metal and that positions the handset a minimum of 15mm from the body. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

2) Due to the conducted power of sensor off+hotspot on, sensor on+hotspot on and sensor on+hotspot off are the same,during the actual testing, the hotspot mode test is taken only under the condition of opening hotspot.

The device is in compliance with Specific Absorption Rate（SAR）for general population/uncontrolled exposure limits according to the FCC rule §2.1093, the ANSI C95.1:1992/IEEE C95.1:1991, the NCRP Report Number 86 for uncontrolled environment, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013.

1.2 RF exposure limits

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

Table 2: RF exposure limits

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

Notes:

* The Spatial Peak value of the SAR averaged over any 1 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

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1.3 EUT Description

<table>
<tr><th colspan="4">Device Information:</th></tr>
<tr><td>Product Name:</td><td colspan="3">Smart Phone</td></tr>
<tr><td>Model:</td><td colspan="3">DRA-L01</td></tr>
<tr><td>FCC ID :</td><td colspan="3">QISDRA-L01</td></tr>
<tr><td>SN:</td><td colspan="3">LJY9K18321900258
9QN9K18314900059
9QN9K18314900058
LJY9K18321900264</td></tr>
<tr><td>Device Type :</td><td colspan="3">Portable device</td></tr>
<tr><td>Device Phase:</td><td colspan="3">Identical Prototype</td></tr>
<tr><td>Exposure Category:</td><td colspan="3">Uncontrolled environment / general population</td></tr>
<tr><td>Hardware Version :</td><td colspan="3">HL1DURAM</td></tr>
<tr><td>Software Version :</td><td colspan="3">DRA-L01 1.0.0.56(C900)</td></tr>
<tr><td>Antenna Type :</td><td colspan="3">Internal antenna</td></tr>
<tr><td>Others Accessories</td><td colspan="3">Headset</td></tr>
<tr><th colspan="4">Device Operating Configurations:</th></tr>
<tr><td>Supporting Mode(s)</td><td colspan="3">GSM850/1900, UMTS Band5,
LTE Band5/7, WiFi 2.4G;BT</td></tr>
<tr><td>Test Modulation</td><td colspan="3">GSM(GMSK/8PSK),UMTS(QPSK/16QAM) ,LTE(QPSK/16QAM),
WiFi(DSSS/OFDM),BT(GFSK)</td></tr>
<tr><td>Device Class</td><td colspan="3">B</td></tr>
<tr><td rowspan="8">Operating Frequency Range(s)</td><td>Band</td><td>Tx (MHz)</td><td>Rx (MHz)</td></tr>
<tr><td>GSM850</td><td>824-849</td><td>869-894</td></tr>
<tr><td>GSM1900</td><td>1850-1910</td><td>1930-1990</td></tr>
<tr><td>UMTS Band 5</td><td>824-849</td><td>869-894</td></tr>
<tr><td>LTE Band 5</td><td>824-849</td><td>869-894</td></tr>
<tr><td>LTE Band 7</td><td>2500-2570</td><td>2620-2690</td></tr>
<tr><td>BT</td><td colspan="2">2402-2480</td></tr>
<tr><td>WiFi 2.4G</td><td colspan="2">2412-2462</td></tr>
<tr><td rowspan="3">GPRS Multislot Class(12)</td><td colspan="2">Max Number of Timeslots in Uplink:</td><td>4</td></tr>
<tr><td colspan="2">Max Number of Timeslots in Downlink:</td><td>4</td></tr>
<tr><td colspan="2">Max Total Timeslot:</td><td>5</td></tr>
<tr><td rowspan="3">EGPRS Multislot Class(12)</td><td colspan="2">Max Number of Timeslots in Uplink:</td><td>4</td></tr>
<tr><td colspan="2">Max Number of Timeslots in Downlink:</td><td>4</td></tr>
<tr><td colspan="2">Max Total Timeslot:</td><td>5</td></tr>
<tr><td>HSDPA UE Category</td><td colspan="3">14</td></tr>
<tr><td>HSUPA UE Category</td><td colspan="3">7</td></tr>
<tr><td>DC-HSDPA UE Category</td><td colspan="3">24</td></tr>
<tr><td rowspan="5">Power Class:</td><td colspan="3">4,tested with power level 5(GSM850)</td></tr>
<tr><td colspan="3">1,tested with power level 0(GSM1900)</td></tr>
<tr><td colspan="3">3, tested with power control “all 1”(UMTS Band 5)</td></tr>
<tr><td colspan="3">3, tested with power control all Max.(LTE Band 5)</td></tr>
<tr><td colspan="3">3, tested with power control all Max.(LTE Band 7)</td></tr>
</table>

Test Channels (low-mid-high):	128-190-251(GSM850)
	512-661-810(GSM1900)
	4132-4182-4233(UMTS Band 5)
	20407-20525-20643(LTE Band 5 BW=1.4MHz)
	20415-20525-20635(LTE Band 5 BW=3MHz)
	20425-20525-20625(LTE Band 5 BW=5MHz)
	20450-20525-20600 (LTE Band 5 BW=10MHz)
	20775-21100-21425 (LTE Band 7 BW=5MHz)
	20800-21100-21400(LTE Band 7 BW=10MHz)
	20825-21100-21375 (LTE Band 7 BW=15MHz)
	20850-21100-21350(LTE Band 7 BW=20MHz)
	1-2-6-10-11 (WiFi 2.4G 802.11b/g/n HT20) 3-4-6-8-9 (WiFi 2.4G 802.11n HT40)
	BT:0-19-39-78

Table 3:Device information and operating configuration

1.3.1 General Description

DRA-L01 is subscriber equipment in the GSM/UMTS/LTE system.The GSM frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900. but only GSM850 and GSM1900 test data included in this report. The UMTS frequency band is band 1/5/8,but only band 5 test data included in this report. The LTE frequency band is band B1/B3/B5/B7/B8/B20,but only band 5/7 test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, LTE/UMTS and GSM/GPRS/EDGE protocol processing, voice, video MMS service, GPS and WIFI etc. Externally it provides micro SD card interface, earphone port (to provide voice service) . It also provides bluetooth module to synchronize data between a PC and the phone, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other bluetooth devices.

Battery information:

Name	Manufacturer/trademark	Description
Rechargeable Li-ion	HuaweiTechnologies Co., Ltd. (Manufacturer: Sunwoda)	Battery Model: HB405979ECW Rated capacity: 2920mAh Nominal Voltage: +3.82V Charging Voltage: +4.4V
	HuaweiTechnologies Co., Ltd. (Manufacturer: SCUD)	
	HuaweiTechnologies Co., Ltd. (Manufacturer: Desay)	

1.3.2 Power reduction specifition

1.3.2.1 Power reduction triggered by proximity sensor and hotspot (2G&3G&4G Main antenna)

This device uses a capacitive proximity sensor that share the same metallic electrode as the transmitting antenna to facilitate triggering in typical user interactivity with the device per KDB616217.
Due to the operating configurations and exposure conditions required by the device, the proximity sensor is used to indicate when the device is held close to a user's body exposure condition. It utilizes the proximity sensor to reduce the output power in specific wireless and operating modes to ensure SAR compliance for the following scenarios: To reduce the output power of main antennas during body operating configurations.
A fixed level power reduction is also applied for some frequency bands when hotspot mode becomes active. When the hotspot is disabled, the power value will be recovered.

Band	**Power Reduction Level Amount (dB)**			
	Main Antenna			
	Hotspot on + capacitive sensor on	Hotspot on + capacitive sensor off	Receiver off, Hotspot off + capacitive sensor on	Other conditions
GSM850(CS)	/	/	1.0	0
GSM850(1TXS)	1.1	1.1	1.1	0
GSM850(2TXS)	1.9	1.9	1.9	0
GSM850(3TXS)	2.3	2.3	2.3	0
GSM850(4TXS)	2.5	2.5	2.5	0
GSM1900(CS)	/	/	6.0	0
GSM1900(1TXS)	6.0	6.0	6.0	0
GSM1900(2TXS)	8.6	8.6	8.6	0
GSM1900(3TXS)	9.9	9.9	9.9	0
GSM1900(4TXS)	11.5	11.5	11.5	0
UMTS Band5	1.0	1.0	1.0	0
LTE B5	1.0	1.0	1.0	0
LTE B7	6.5	6.5	6.5	0

1.3.2.2 Power reduction triggered by specific use conditions

This device uses the receiver to indicate whether the user is making a call in head scenario or not. The selection between head and body power levels is based on the receiver detection mechanism. It can determine proximity to head or body and set the relevant power level for WiFi antennas accordingly.

Note : For Head SAR test, as the audio receiver only works in voice mode when the user is making a call in head scenario, and the lack of the third-party VoIP server and the unstandardized VOIP operating characteristics, So the test script is used to trigger the receiver on during the test. The test scripts function is only used to trigger audio receiver on and simulate voice and VOIP usage scene. It can be ensured that the unmodified settings in production units, including maximum output power, amplifier gain and other RF performance or tuning parameters, are used for SAR measurement.

1.3.2.3 Power reduction by contry code detection mechanism

This device uses the mobile country code (MCC) to indicate whether the users in CE countries or FCC countries.The selection between CE countries and FCC countries power levels is based on the country code detection mechanism. It can determine the countries where users are and set the relevant power level for WiFi antennas accordingly.

Antenna	MCC OF CE COUNTRY (CE standard)	MCC OF FCC COUNTRY (FCC standard)
WiFi 2.4G	Power Level A	Power Level B

For FCC SAR test: Standalone FCC SAR of Wifi 2.4G is evaluated at power level B;(FCC mobile country code)

1.3.2.4 WiFi and LTE IDC mechanism clarifications

1) This IDC mechanism will be enabled when the following conditions are met:

a) LTE B7/B20 and WIFI work simultaneously.

b) When LTE working frequency meets one of the three following requirements:

i) LTE B7 DL frequency locates around the IMD3(three order intermodulation) of WIFI and LTE B7 UL frequency.

ii) LTE B20 DL frequency locates around the three order intermodulation of WIFI and LTE B20 UL frequency.

iii) LTE B20 DL frequency locates around the three harmonic of WIFI.

For SAR test: Since power reduction is applied for WiFi 2.4G when simultaneously transmitting with the 2/3/4G antenna in certain simultaneous transmission conditions. The standalone SAR compliance still uses the standalone SAR results tested at the maximum output power level without any power reduction.

The following tables summerize the key power reduction information. The detailed full power and reduced conducted power measurement results are provided in section 7 of this report:

Band	Power Reduction Level Amount (dB)				
	Receiver off				Receiver on (2G&3G&4G Antenna(Voice)+WIFI Antenna or WIFI(Voice) only)
	MCC of CE sountries (Full power level)	MCC of FCC countries（Reduced power level）	MCC of CE sountries (power level of WIFI and LTE IDC(In-Device Coexistence) mechanism)	MCC of FCC sountries (power level of WIFI and LTE IDC(In-Device Coexistence) mechanism)	ALL MODE
WiFi 2.4G 802.11b	0	0	3	3	5
WiFi 2.4G 802.11g (CH1&CH11)	0	1.5	2	2	4
WiFi 2.4G 802.11g (other channels)	0	0	2	2	4
WiFi 2.4G 802.11n(HT20) (CH1&CH11)	0	1.5	2	2	4
WiFi 2.4G 802.11n(HT20) (other channels)	0	0	2	2	4
WiFi 2.4G 802.11n(HT40) (CH3&CH9)	0	1.5	0	1.5	2
WiFi 2.4G 802.11n(HT40) (other channels)	0	0	0	0	2

1.4 Test specification(s)

ANSI C95.1:1992 /IEEE C95.1:1991	Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.
IEEE Std 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
KDB941225 D01	3G SAR Procedures v03r01
KDB941225 D05	SAR for LTE Devices v02r05
KDB941225 D06	Hotspot SAR v02r01
KDB447498 D01	General RF Exposure Guidance v06
KDB616217 D04	SAR for laptop and tablets v01r02
KDB648474 D04	Handsets SAR v01r03
KDB248227 D01	SAR Guidance for IEEE 802 11 Wi-Fi SAR v02r02
KDB865664 D01	SAR measurement 100 MHz to 6 GHz v01r04
KDB865664 D02	RF Exposure Reporting v01r02
KDB690783 D01	SAR Listings on Grants v01r03

1.5 Testing laboratory

Test Site	The Reliability Laboratory of Huawei Technologies Co., Ltd.
Test Location	Section G1,Huawei Base Bantian, Longgang District, Shenzhen 518129, P.R. China
Telephone	+86 755 28780808
Fax	+86 755 89652518
State of accreditation	The Test laboratory (area of testing) is accredited according to ISO/IEC 17025. CNAS Registration number: L0310 A2LA TESTING CERT # 2174.01 & 2174.02 & 2174.03

1.6 Applicant and Manufacturer

Company Name	HUAWEI TECHNOLOGIES CO., LTD
Address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

1.7 Application details

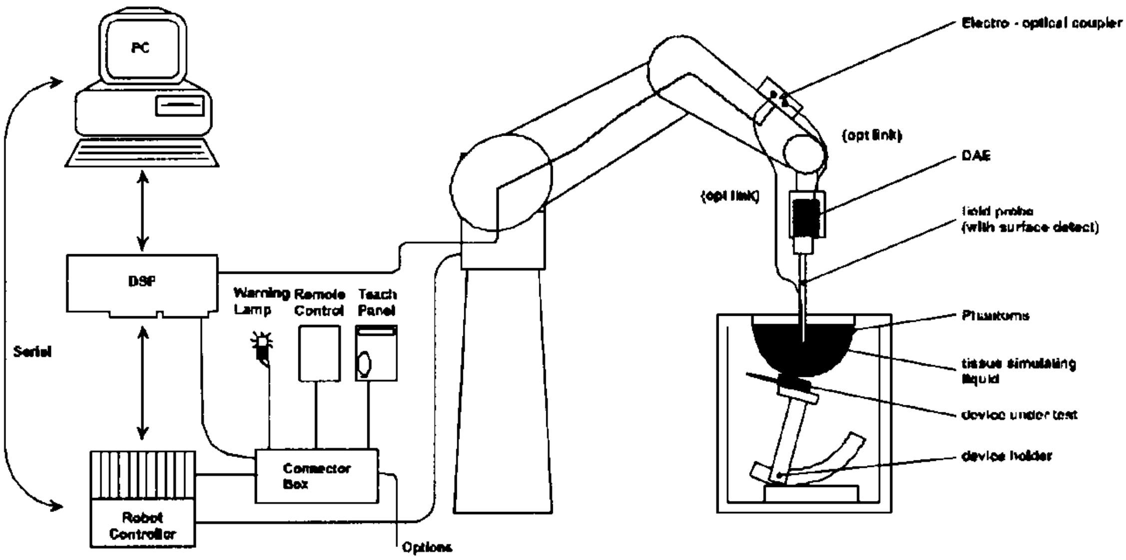
Start Date of test	2018-04-08
End Date of test	2018-04-11

1.8 Ambient Condition

Ambient temperature	18°C – 25°C
Relative Humidity	30% – 70%

2 SAR Measurement System

2.1 SAR Measurement Set-up



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

- A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).

- A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

- A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- A unit to operate the optical surface detector which is connected to the EOC.
- The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY measurement server.
- The DASY measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 7.
- DASY software and SEMCAD data evaluation software.
- Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- System check dipoles allowing to validate the proper functioning of the system.

2.2 Test environment

The DASY measurement system is placed at the head end of a room with dimensions:
5 x 2.5 x 3 m³, the SAM phantom is placed in a distance of 75 cm from the side walls and 1.1m from the rear wall. Above the test system a 1.5 x 1.5 m² array of pyramid absorbers is installed to reduce reflections from the ceiling.
Picture 1 of the photo documentation shows a complete view of the test environment.
The system allows the measurement of SAR values larger than 0.005 mW/g.

2.3 Data Acquisition Electronics description

The data acquisition electronics (DAE) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converte and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

DAE4

Input Impedance	200MOhm	
The Inputs	symmetrical and floating	
Common mode rejection	above 80 dB	

2.4 Probe description

These probes are specially designed and calibrated for use in liquids with high permittivities. They should not be used in air, since the spherical isotropy in air is poor (±2 dB). The dosimetric probes have special calibrations in various liquids at different frequencies.

Isotropic E-Field Probe ES3DV3 for Dosimetric Measurements

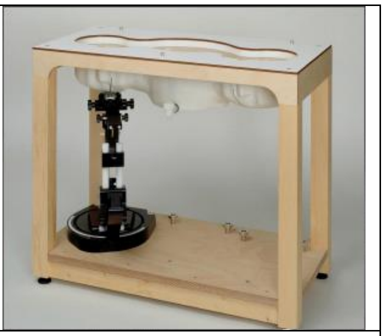
Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	 
Calibration	ISO/IEC 17025 calibration service available.	
Frequency	10 MHz to 4 GHz; Linearity: ± 0.2 dB (30 MHz to 4 GHz)	
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)	
Dynamic range	5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB	
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm	
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones	

Isotropic E-Field Probe EX3DV4 for Dosimetric Measurements

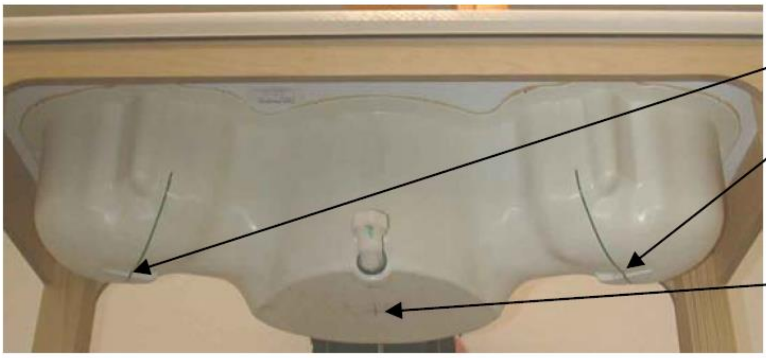
Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	 
Calibration	ISO/IEC 17025 calibration service available.	
Frequency	10 MHz to >6 GHz; Linearity: ± 0.2 dB (30 MHz to 6 GHz)	
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)	
Dynamic range	10 µW/g to > 100 mW/g; Linearity: ± 0.2 dB(noise:typically<1µW/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: 1mm	
Application	High precision dosimetric measurements in any exposure scenario(e.g.,very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%	

2.5 Phantom description

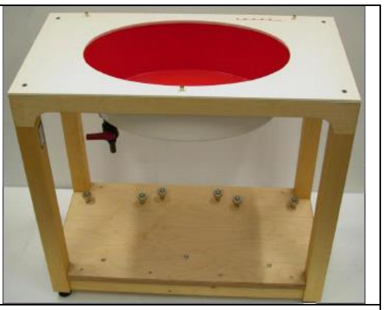
SAM Twin Phantom

Shell Thickness	2mm±0.2mm;The ear region:6.0±0.2mm	
Filling Volume	Approximately 25 liters	
Dimensions	Length:1000mm; Width:500mm; Height: adjustable feet	
Measurement Areas	Left hand Right hand Flat phantom	
The bottom plate contains three pairs of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to cover the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. Free space scans of devices on top of this phantom cover are possible. Three reference marks are provided on the phantom counter. These reference marks are used to teach the absolute phantom position relative to the robot.		

The following figure shows the definition of reference point:



ELI4 Phantom

Shell Thickness	2mm±0.2mm	
Filling Volume	Approximately 30 liters	
Dimensions	Major axis:600mm; Minor axis:400mm;	
Measurement Areas	Flat phantom	
The ELI4 phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30MHz to 6GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209-2 and all known tissue simulating liquids.		

The phantom shell material is resistant to all ingredients used in the tissue-equivalent liquid recipes. The shell of the phantom including ear spacers is constructed from low permittivity and low loss material, with a relative permittivity $2 \le \varepsilon r \le 5$ at ≤3 GHz,$3 \le \varepsilon r \le 4$ at >3 GHz and and a loss tangent ≤0.05.

2.6 Device holder description

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

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε =3 and loss tangent σ =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.
The device holder permits the device to be positioned with a tolerance of ±1° in the tilt angle.

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

2.7 Test Equipment List

This table gives a complete overview of the SAR measurement equipment.
Devices used during the test described are marked ☒

	Manufacturer	Device	Type	Serial number	Date of last calibration	Valid period
☒	SPEAG	Dosimetric E-Field Probe	EX3DV4	3744	2017-07-24	One year
☒	SPEAG	Dosimetric E-Field Probe	EX3DV4	7489	2018-01-09	One year
☒	SPEAG	835 MHz Dipole	D835V2	4d059	2016-04-20	Threeyears
☒	SPEAG	1900 MHz Dipole	D1900V2	5d143	2017-09-20	Three years
☒	SPEAG	2450 MHz Dipole	D2450V2	860	2017-11-15	Three years
☒	SPEAG	2600 MHz Dipole	D2600V2	1021	2017-07-21	Three years
☒	SPEAG	Data acquisition electronics	DAE4	1236	2017-07-21	One year
☒	SPEAG	Data acquisition electronics	DAE4	905	2017-06-20	One year
☒	SPEAG	Software	DASY 5	N/A	NCR	NCR
☒	SPEAG	Twin Phantom	SAM1	TP-1475	NCR	NCR
☒	SPEAG	Twin Phantom	SAM2	TP-1474	NCR	NCR
☒	SPEAG	Twin Phantom	SAM3	TP-1597	NCR	NCR
☒	SPEAG	Twin Phantom	SAM4	TP-1620	NCR	NCR
☒	R & S	Universal Radio Communication Tester	CMU 200	111379	2017-12-30	One year
☒	R & S	Universal Radio Communication Tester	CMW 500	158850	2017-06-13	One year
☒	Anritsu	Singal Analyser	MS2690A	6261767335	2017-10-24	One year
☒	Anritsu	Radio Communication Analyser	MT8821C	6201735100	2017-06-01	One year
☒	Agilent	Network Analyser	E5071C	MY46107368	2017-10-27	One year
☒	Agilent	Dielectric Probe Kit	85070E	2484	NCR	NCR
☒	Keysight	Signal Generator	E8257D	MY56440071	2017-12-25	One year
☒	MINI-CIRCUITS	Amplifier	ZHL-42W	QA1402001	NCR	NCR
☒	SHX	Dual Directional Coupler	DDTO-4-20	17121801	2018-01-02	One year
☒	AR	Directional Coupler	DC7144M1	31190	2017-05-26	One year
☒	Keysight	Power Meter	E4417A	MY54100027	2018-03-24	One year
☒	Keysight	Power Meter	E9321A	MY54130007	2018-03-24	One year
☒	R & S	Power Meter Sensor	NRP-Z11	106288	2017-07-07	One year
☒	R & S	Power Meter Sensor	NRP-Z11	100740	2017-07-07	One year

Note:
1) Per KDB865664D01 requirements for dipole calibration, the test laboratory has adopted three-year extended calibration interval. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.

a) There is no physical damage on the dipole;
b) System check with specific dipole is within 10% of calibrated value;
c) The most recent return-loss result, measured at least annually, deviates by no more than 20% from the previous measurement.
d) The most recent measurement of the real or imaginary parts of the impedance, measured at least annually is within 5Ω from the previous measurement.

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

3 SAR Measurement Procedure

3.1 Scanning procedure

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

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

- For power drift measurement, DASY software supports that the reference position can be either the selected section's grid reference point or a user point. If the E-field of power reference measurement in the default grid reference point is very small, the test lab may set the reference position to the user point near the hotspot location to avoid large measurement uncertainty.

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

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

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

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

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

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

3.2 Spatial Peak SAR Evaluation

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

- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting ‘Graph Evaluated’.

- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.

- All neighboring volumes are evaluated until no neighboring volume with a higher average value is found.

Extrapolation

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

Interpolation

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

Volume Averaging

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

Advanced Extrapolation

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

3.3 Data Storage and Evaluation

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], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

Data Evaluation by SEMCAD

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

Probe parameters:	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion factor	$ConvF_i$
	- Diode compression point	Dcpi
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the 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:

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

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

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

E-field probes: $E_i = (V_i / Norm_i \bullet ConvF)^{1/2}$
H-field probes: $H_i = (V_i)^{1/2} \bullet (a_{i0} + a_{i1}f + a_{i2}f^2)/f$

with V_i = compensated signal of channel i (i = x, y, z)
$Norm_i$ = sensor sensitivity of channel i (i = x, y, z) $[mV/(V/m)^2]$ for E-field Probes
ConvF = sensitivity enhancement in solution
a_{ij} = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
E_i = electric field strength of channel i in V/m
H_i = magnetic field strength of channel i in A/m

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

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

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

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

with SAR = local specific absorption rate in mW/g
E_{tot} = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm^3

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

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

with P_{pwe} = equivalent power density of a plane wave in mW/cm^2
E_{tot} = total electric field strength in V/m
H_{tot} = total magnetic field strength in A/m

4 System Verification Procedure

4.1 Tissue Verification

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

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

Ingredients (% of weight)	**Head Tissue**					
Frequency Band (MHz)	750	835	1750	1900	2450	2600
Water	39.2	41.45	52.64	55.242	62.7	55.242
Salt (NaCl)	2.7	1.45	0.36	0.306	0.5	0.306
Sugar	57.0	56.0	0.0	0.0	0.0	0.0
HEC	0.0	1.0	0.0	0.0	0.0	0.0
Bactericide	0.0	0.1	0.0	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0
DGBE	0.0	0.0	47.0	44.542	36.8	44.452
Ingredients (% of weight)	**Body Tissue**					
Frequency Band (MHz)	750	835	1750	1900	2450	2600
Water	50.3	52.4	69.91	69.91	73.2	64.493
Salt (NaCl)	1.60	1.40	0.13	0.13	0.04	0.024
Sugar	47.0	45.0	0.0	0.0	0.0	0.0
HEC	0.0	1.0	0.0	0.0	0.0	0.0
Bactericide	0.0	0.1	0.0	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0
DGBE	0.0	0.0	29.96	29.96	26.7	32.252

Table 4: Tissue Dielectric Properties

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

☒**Simulating Head Liquid (HBBL600-6000MHz),Manufactured by SPEAG:**

Ingredients	(% by weight)
Water	50-65%
Esters,Emulsifiers,Inhibitors	10-30%
Sodium salt	8-25%

☒**Simulating Body Liquid (MBBL600-6000MHz),Manufactured by SPEAG:**

Ingredients	(% by weight)
Water	60-80%
Esters,Emulsifiers,Inhibitors	20-40%
Sodium salt	0-1.5%

Tissue Type	Target Frequency	Target Tissue		Measured Tissue		Deviation (Within +/-5%)		Liquid Temp.	Test Date
		Permit-tivity	Conduc-tivity [S/m]	Permit-tivity	Conduc-tivity [S/m]	$\Delta\varepsilon_r$	$\Delta\sigma$		
835MHz Head	825	41.60	0.90	42.36	0.905	1.83%	0.50%	21.5°C	2018/4/9
	835	41.50	0.90	42.33	0.907	2.00%	0.80%		
	850	41.50	0.92	42.27	0.912	1.86%	-0.85%		
1900MHz Head	1850	40.00	1.40	41.16	1.399	2.90%	-0.07%	22°C	2018/4/10
	1880	40.00	1.40	41.12	1.415	2.80%	1.07%		
	1900	40.00	1.40	41.10	1.425	2.75%	1.79%		
	1910	40.00	1.40	41.09	1.431	2.73%	2.21%		
2450MHz Head	2410	39.30	1.76	40.17	1.840	2.21%	4.55%	22°C	2018/4/11
	2435	39.20	1.79	40.15	1.855	2.42%	3.63%		
	2450	39.20	1.80	40.13	1.866	2.37%	3.67%		
	2460	39.20	1.81	40.12	1.872	2.35%	3.43%		
2600MHz Head	2510	39.12	1.86	39.63	1.915	1.30%	2.96%	21.6°C	2018/4/10
	2535	39.10	1.89	39.58	1.935	1.23%	2.38%		
	2560	39.00	1.92	39.52	1.956	1.33%	2.03%		
	2600	39.00	1.96	39.45	1.986	1.15%	1.33%		
835MHz Body	825	55.20	0.97	53.42	0.927	-3.22%	-4.44%	21.5°C	2018/4/9
	835	55.20	0.97	53.41	0.930	-3.24%	-4.08%		
	850	55.20	0.99	53.37	0.945	-3.32%	-4.51%		
1900MHz Body	1850	53.30	1.52	51.87	1.484	-2.68%	-2.37%	22.2°C	2018/4/10
	1880	53.30	1.52	51.84	1.505	-2.74%	-0.99%		
	1900	53.30	1.52	51.82	1.519	-2.78%	-0.07%		
	1910	53.30	1.52	51.82	1.527	-2.78%	0.46%		
2450MHz Body	2410	52.80	1.91	51.85	1.887	-1.80%	-1.20%	21.8°C	2018/4/11
	2435	52.70	1.94	51.84	1.908	-1.63%	-1.65%		
	2450	52.70	1.95	51.82	1.921	-1.67%	-1.49%		
	2460	52.70	1.96	51.82	1.930	-1.67%	-1.53%		
2600MHz Body	2510	52.62	2.03	51.82	2.053	-1.52%	1.13%	22.4°C	2018/4/8
	2535	52.59	2.07	51.78	2.077	-1.54%	0.34%		
	2560	52.57	2.09	51.74	2.103	-1.58%	0.62%		
	2600	52.50	2.16	51.69	2.143	-1.54%	-0.79%		

Table 5:Measured Tissue Parameter

Note: 1) The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 °C of the conditions expected during the SAR evaluation to satisfy protocol requirements.

2) KDB 865664 was ensured to be applied for probe calibration frequencies greater than or equal to 50MHz of the EUT frequencies.

3) The above measured tissue parameters were used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies. The SAR test plots may slightly differ from the table above since the DASY rounds to three significant digits.

4.2 System Check

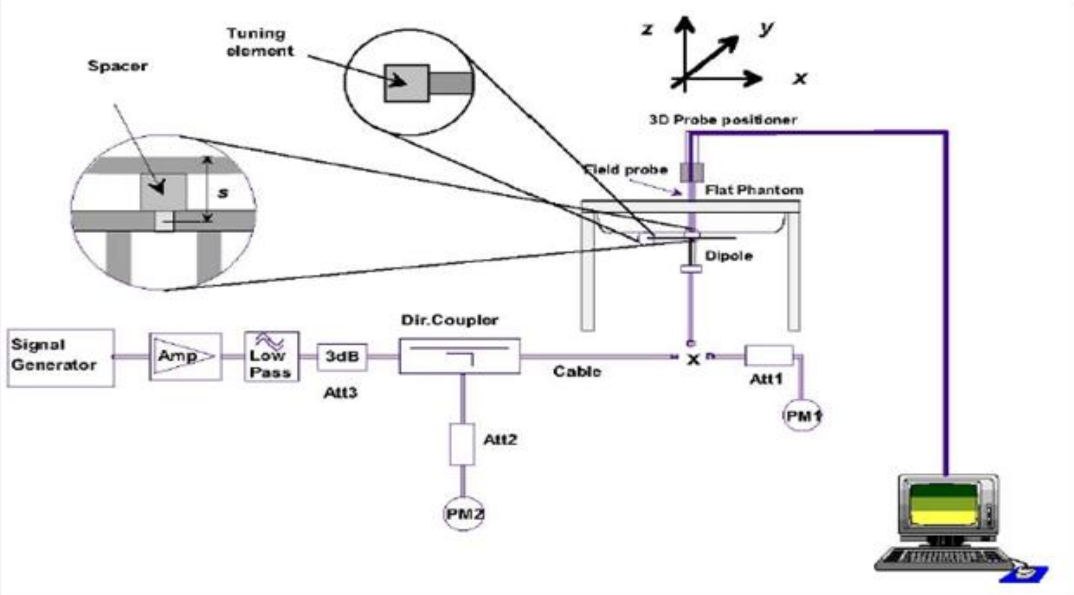
The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system check is performed with tissue equivalent material according to IEEE 1528 (described above). The following table shows system check results for all frequency bands and tissue liquids used during the tests(Graphic Plot(s) see Appendix A).

System Check	Target SAR (Normalized to 1W)		Measured SAR (Normalized to 1W)		Deviation (Within +/-10%)		Test Date
	1-g (mW/g)	10-g (mW/g)	1-g (mW/g)	10-g (mW/g)	Δ1-g	Δ10-g	
835MHz Head	9.30	6.05	9.68	6.36	4.09%	5.12%	2018/4/9
1900MHz Head	39.10	20.50	39.44	20.40	0.87%	-0.49%	2018/4/10
2450MHz Head	51.20	23.90	52.80	24.52	3.12%	2.59%	2018/4/11
2600MHz Head	58.70	26.10	56.80	25.52	-3.24%	-2.22%	2018/4/10
835MHz Body	9.41	6.20	9.60	6.12	2.02%	-1.29%	2018/4/9
1900MHz Body	39.40	20.80	39.48	21.92	0.20%	5.38%	2018/4/10
2450MHz Body	50.10	23.50	51.20	25.28	2.20%	7.57%	2018/4/11
2600MHz Body	55.90	24.90	52.80	25.24	-5.55%	1.37%	2018/4/8

Table 6:System Check Results

4.3 System check Procedure

The system check is performed by using a system check dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a plexiglass spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SAM. It is fed with a power of 250 mW(below 3GHz) or 100mW(3-6GHz). To adjust this power, a power meter is used. The power sensor is connected to the cable before the system check to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the system check to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test (result on plot).
System check results have to be equal or near the values determined during dipole calibration (target SAR in table above) with the relevant liquids and test system.



5 SAR measurement variability and uncertainty

5.1 SAR measurement variability

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ⩾ 0.80 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ⩾ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ⩾ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

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

The detailed repeated measurement results are shown in Section 7.2.

5.2 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.

6 SAR Test Configuration

6.1 Test Positions Configuration

6.1.1 General considerations

Per IEEE 1528-2013，two imaginary lines on the handset were established: the vertical centerline and the horizontal line (See Figure 1).

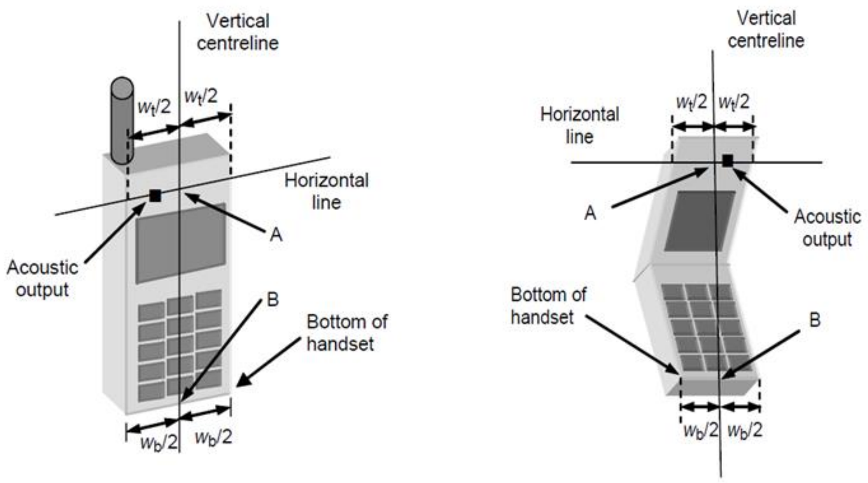


Figure 1 Hand Vertical Center & Horizontal Line Reference Points

6.1.2 Head Exposure Condition

Per IEEE 1528-2013, Head SAR measurements were made in the “cheek” position (See Figure 2) and the “tilt” position (See Figure 3). The device should be tested in both positions on left and right sides of the SAM phantom.

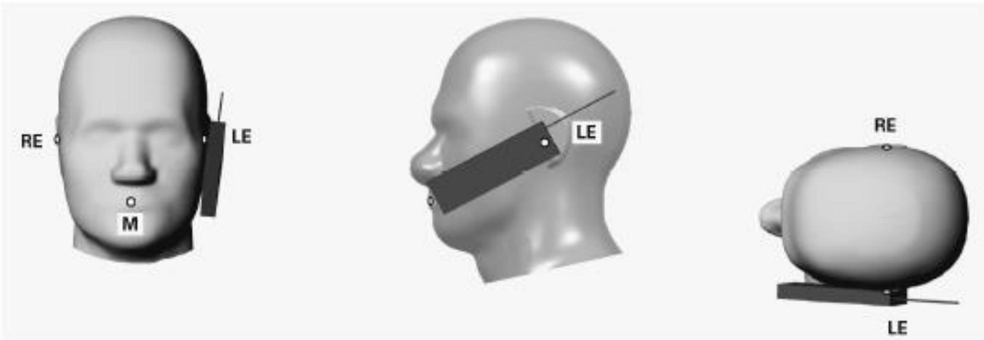


Figure 2 Front, Side and Top View of Cheek Position

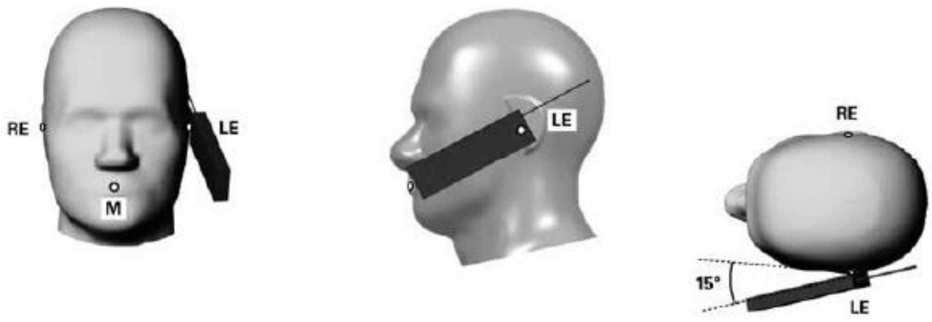


Figure 3 Front, Side and Top View of Tilt 15° Position

Note:

M Mouth reference point

LE Left ear reference point (ERP)

RE Right ear reference point(ERP)

6.1.3 Body-worn Exposure Condition

Body-worn operating configurations are tested with the holder attached to the device and positioned against a flat phantom with test separation distance of 15mm in a normal use configuration (See Figure 4). Per FCC KDB648474 D04, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB 447498 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

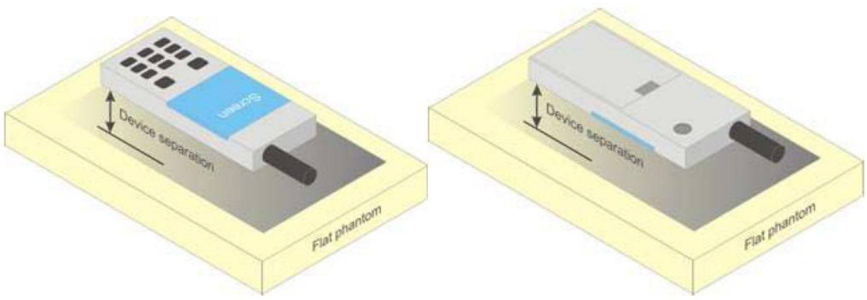


Figure 4 Test position for Body-Worn device

6.1.4 Hotspot Exposure Condition

Per FCC KDB 941225D06, the SAR test separation distance for hotspot mode is determined according to device form factor. When the overall length and width of a device is > 9 cm x 5 cm, a test separation distance of 10 mm is required for hotspot mode SAR measurements. A test separation distance of 5 mm or less is required for smaller devices. Hotspot mode SAR is measured for all edges and surfaces of the device with a transmitting antenna located within 25 mm from that surface or edge; for the data modes, wireless technologies and frequency bands supporting hotspot mode. The SAR results are used to determine simultaneous transmission SAR test exclusion for hotspot mode; otherwise, simultaneous transmission SAR measurement is required.

6.2 3G SAR Test Reduction Procedure

Per KDB941225 D01, 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.

6.3 GSM Test Configuration

SAR tests for GSM850 and GSM1900, a communication link is set up with a base station by air link. Using CMU200 the power lever is set to “5”and “0” in SAR of GSM850 and GSM1900. The tests in the band of GSM850 and GSM1900 are performed in the mode of GPRS/EGPRS function. Since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5. The EGPRS class is 12 for this EUT, it has at most 4 timeslots in uplink, and at most 4 timeslots in downlink, the maximum total timeslot is 5.

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

6.4 UMTS 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 requied in the SAR report. All configurations that are not supported by the handset or cannot be measured due to technical or equipment limitations must be clearly identified.

2) WCDMA

a. Head SAR Measurements

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

b. Body SAR Measurements

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

3) HSDPA

SAR for body exposure configurations is measured according to the "Body SAR Measurements'' procedures of 3G device. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ 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.

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

HSDPA should be configured according to UE category of a test device. The number of HS-DSCH/HS-PDSCHs, HAPRQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission condition, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. The β_c and β_d gain factors for DPCCH and DPDCH were set according to the values in the below table, β_{hs} for HS-DPCCH is set automatically to the correct value when ΔACK, ΔNACK, ΔCQI = 8. The variation of the β_c /β_d ratio causes a power reduction at sub-tests 2 - 4.

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

Note 1: ΔACK, ΔNACK and ΔCQI = 8 $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$

Note 2 : CM=1 for β_c/β_d= 12/15, β_{hs}/β_c = 24/15. For all other combinations of DPDCH,DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 3 : For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to β_c = 11/15 and β_d = 15/15

Table 7: Sub-tests for UMTS Release 5 HSDPA

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

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

Table 9:HSDPA UE category

4) HSUPA

SAR for body exposure configurations is measured according to the "Body SAR Measurements" procedures of 3G device. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

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

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

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

Note 1: 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 10: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 11:HSUPA UE category

5) DC-HSDPA

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

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

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0

Table E.5.0: Levels for HSDPA connection setup

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

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13

The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.

The measurements were performed with a Fixed Reference Channel (FRC) H-Set 12 with QPSK

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

Table 12:settings of required H-Set 12 QPSK acc. to 3GPP 34.121

Note:

1.The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table above.

2.Maximum number of transmission is limited to 1,i.e.,retransmission is not allowed. The redundancy and constellation version 0 shall be used.

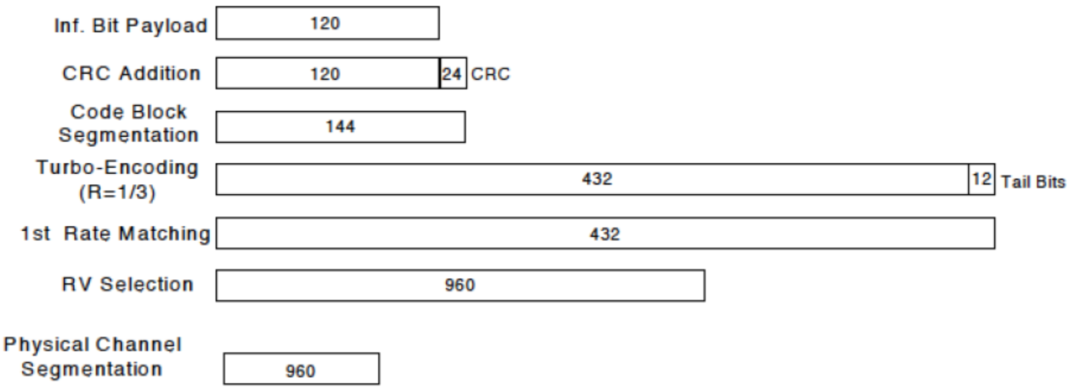


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

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

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

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

Note 2 : CM=1 for β_c/β_d= 12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH,DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 3 : For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to β_c= 11/15 and β_d= 15/15

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

Note:

1.The Dual Carriers transmission only applies to HSDPA physical channels

2.The Dual Carriers belong to the same Node and are on adjacent carriers.

3.The Dual Carriers do not support MIMO to serve UEs configured for dual cell operation

4.The Dual Carriers operate in the same frequency band .

5.The device doesn't support the modulation of 16QAM in uplink but 64QAM in downlink for DC-HSDPA mode.

6.The device doesn't support carrier aggregation for it just can operate in Release 8.

6) HSPA+

Per KDB941225D01, SAR is required for Rel. 7 HSPA+ when SAR is required for Rel. 6 HSPA; otherwise, the 3G SAR test reduction procedure is applied to (uplink) HSPA+ with 12.2 kbps RMC as the primary mode. Power is measured for HSPA+ that supports uplink 16 QAM according to configurations in Table C.11.1.4 of 3GPP TS 34.121-1 to determine SAR test reduction.

Table C.11.1.4: β values for transmitter characteristics tests with HS-DPCCH and E-DCH with 16QAM

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

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.

Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).

Note 3: DPDCH is not configured, therefore the β_c is set to 1 and β_d = 0 by default.

Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signalled to use the extrapolation algorithm.

6.5 LTE Test Configuration

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

1) Spectrum Plots for RB configurations

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

2) MPR

When MPR is implemented permanently within the UE, regardless of network requirements, only those RB configurations allowed by 3GPP for the channel bandwidth and modulation combinations may be tested with MPR active. Configurations with RB allocations less than the RB thresholds required by 3GPP must be tested without MPR.

The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

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

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

3) A-MPR

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

4) LTE procedures for SAR testing

A) Largest channel bandwidth standalone SAR test requirements

i) QPSK with 1 RB allocation

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

ii) QPSK with 50% RB allocation

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

iii) QPSK with 100% RB allocation

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in i) and ii) are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

iv) Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

B) Other channel bandwidth standalone SAR test requirements

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

6.6 WiFi Test Configuration

For WiFi SAR testing, a communication link is set up with the testing software for WiFi mode test. During the test,at the each test frequency channel, the EUT is operated at the RF continuous emission mode. Per KDB 248227D01, a minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The *reported* SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

6.6.1 Initial Test Position Procedure

For exposure condition with multiple test position, such as handsets operating next to the ear, devices with hotspot mode or UMPC mini-tablet , procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all position in an exposure condition. The test position with the highest extrapolated(peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4W/kg, no additional testing for the remaining test position is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8W/kg or all test position are measured. 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.

6.6.2 Initial Test Configuration Procedure

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 (see section 5.3.2 of KDB 248227D01). SAR test reduction of subsequent highest output test channels is based on the *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 the subsequent next highest measured output power channel(s) in the initial test configuration until the *reported* SAR is ≤ 1.2 W/kg or all required channels are tested.

6.6.3 Sub Test Configuration Procedure

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.

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

6.6.4 WiFi 2.4G SAR Test 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.

A) 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 (section 3.1 of of KDB 248227D01) 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.

B) 2.4GHz 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 of of KDB 248227D01). 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.

6.6.5 OFDM Transmission Mode SAR Test Channel Selection Requirements

For 2.4 GHz band, When the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth,lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations(for example 802.11g and 802.11n, with the same channel bandwidth, modulation, and data rate, etc), the lower order 802.11 mode (i.e., 802.11g is chosen over 802.11n) is used for SAR measurement. When the maximum output power are the same for multiple test channel, either according to the default or additional power measurement requirement, SAR is measured using the channel closest to the middle of the frequency band or aggregted band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

6.7 Power Reduction Specification

6.7.1 Capacitive proximity sensor power reduction test configurations

This device uses a proximity sensor that shares the same metallic electrode as the main transmitting antenna to facilitate triggering in typical user interactivity with the device.

Due to the operating configurations and exposure conditions required by the device, the proximity sensor is used to indicate when the device is held close to a user's body/hotspot exposure condition. It utilizes the proximity sensor to reduce the output power in specific wireless and operating modes of main antenna to ensure SAR compliance.

The following tables summerize the key power reduction information for proximity sensor. The test procedures in KDB 616217 should be applied to determine proximity sensor triggering distances, and sensor coverage for normal and tilt positions. To ensure all production units are compliant, it is generally necessary to reduce the triggering distance determined from the triggering tests by 1 mm, or more if it is necessary, and use the smallest distance for movements to and from the phantom, minus 1 mm, as the sensor triggering distance for determining the SAR measurement distance.

Band	**Power Reduction Level Amount (dB)**			
	Main Antenna			
	Hotspot on + capacitive sensor on	Hotspot on + capacitive sensor off	Receiver off, Hotspot off + capacitive sensor on	Other conditions
GSM850(CS)	/	/	1	0
GSM850(1TXS)	1.1	1.1	1.1	0
GSM850(2TXS)	1.9	1.9	1.9	0
GSM850(3TXS)	2.3	2.3	2.3	0
GSM850(4TXS)	2.5	2.5	2.5	0
GSM1900(CS)	/	/	6	0
GSM1900(1TXS)	6	6	6	0
GSM1900(2TXS)	8.6	8.6	8.6	0
GSM1900(3TXS)	9.9	9.9	9.9	0
GSM1900(4TXS)	11.5	11.5	11.5	0
UMTS Band5	1	1	1	0
LTE B5	1	1	1	0
LTE B7	6.5	6.5	6.5	0

1) Procedures for determining proximity sensor triggering distances

The device was tested by the test lab to determine the proximity sensor triggering distances for the front side, back side and bottom side of the device. To ensure all production units are compliant, the smallest separation distance determined by the sensor triggering minus 1 mm, must be used as the test separation distance for SAR testing.

the proximity sensor triggering distance measurement method are as below:

Picture: Proximity sensor triggering distances assessment (Bottom side)

Picture: Proximity sensor triggering distances assessment (Back side)

Table: Summary of Trigger Distances

Band(MHz)	Trigger distance-Bottom Side		Trigger distance-Back Side	
	Moving toward phantom	Moving away from phantom	Moving toward phantom	Moving away from phantom
GSM850(CS)	13mm	14mm	15mm	18mm
GSM850(1TXS)	13mm	14mm	15mm	18mm
GSM850(2TXS)	13mm	14mm	15mm	18mm
GSM850(3TXS)	13mm	14mm	15mm	18mm
GSM850(4TXS)	13mm	14mm	15mm	18mm
GSM1900(CS)	13mm	14mm	15mm	18mm
GSM1900(1TXS)	13mm	14mm	15mm	18mm
GSM1900(2TXS)	13mm	14mm	15mm	18mm
GSM1900(3TXS)	13mm	14mm	15mm	18mm
GSM1900(4TXS)	13mm	14mm	15mm	18mm
UMTS Band 5	13mm	14mm	15mm	18mm
LTE Band 5	13mm	14mm	15mm	18mm
LTE Band 7	13mm	14mm	15mm	18mm

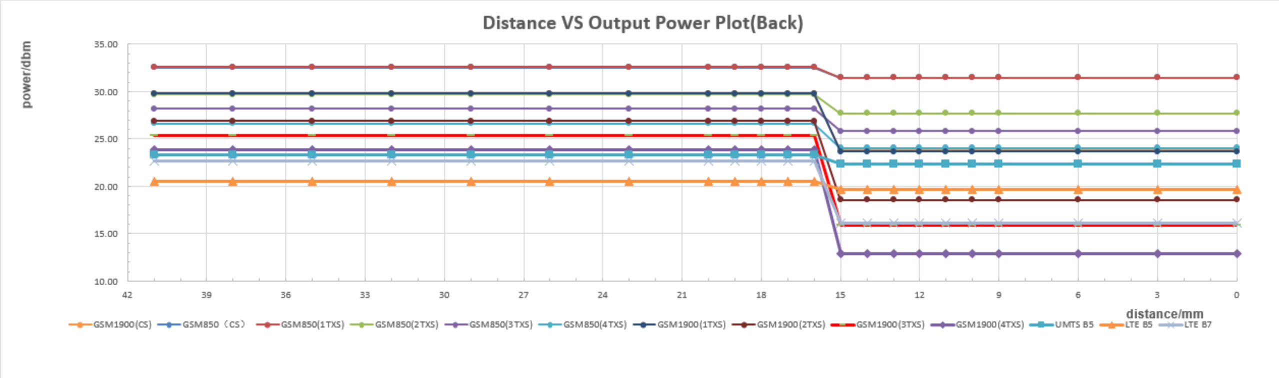
Note:

1） For body-worn SAR, no additional SAR test with sensor off is required since the sensor triggering distance is ≤15mm. Body-worn SAR is tested at the full power level.

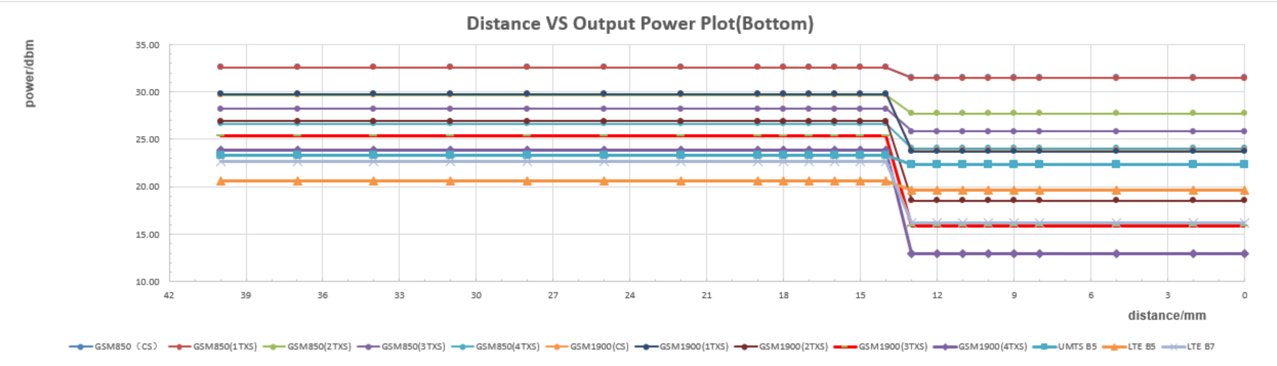
2） For hotspot SAR, no additional SAR test with sensor off is required since the power level in hotspot mode with sensor off and sensor on are the same.

The detailed conducted power measurement data to determine the triggering distances is as below:

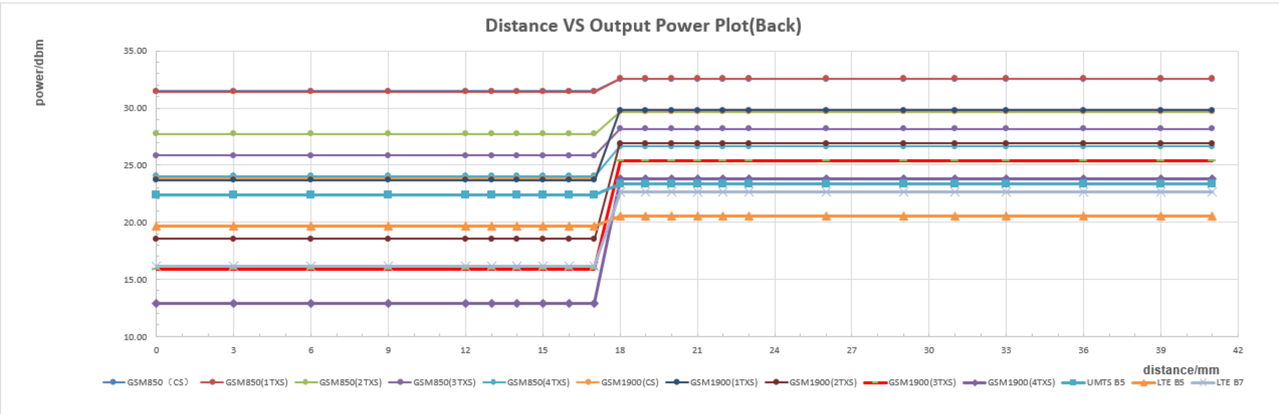
The DUT(Back side) is moved towards the flat phantom



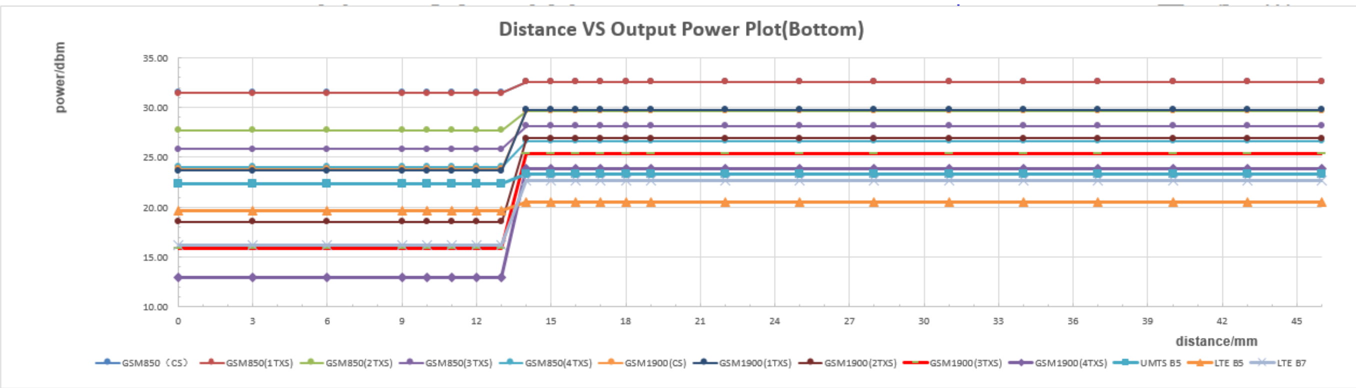
The DUT(Bottom side) is moved towards the flat phantom



The DUT(Back side) is moved away from the flat phantom



The DUT(Bottom side) is moved away from the flat phantom



Conclusion: It can be ensured that the proximity sensor can be valid triggered.

2) Procedures for determining antenna and proximity sensor coverage

There is no spatial offset between the Main antenna and the proximity sensor element, so procedures for determining the proximity sensor coverage does not need to be assessed per KDB616217.

3) Procedures for determining device tilt angle influences to proximity sensor triggering

The DUT was positioned directly below the flat phantom at the minimum measured trigger distance with Bottom side parallel to the base of the flat phantom for each band.

The EUT was rotated about Bottom side for angles up to +/- 45°. If the output power increased during the rotation the DUT was moved 1mm toward the phantom and the rotation repeated. This procedure was repeated until the power remained reduced for all angles up to +/- 45°.

The proximity sensor triggering tilt angle measurement method are as below:

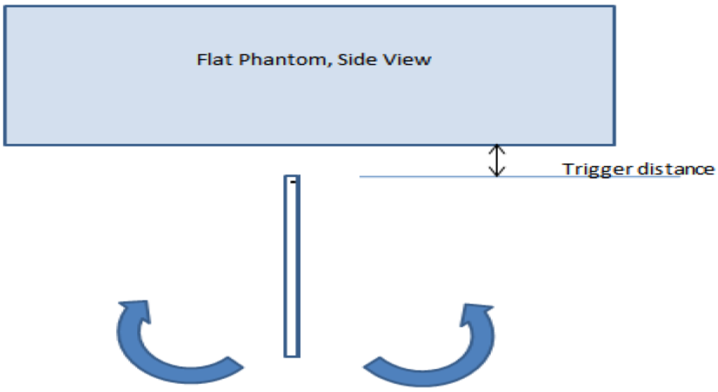


Table: Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering(Bottom side)

Band(MHz)	Minimum trigger distance at which power reduction was maintained over ±45°	Power Reduction Status										
		-45°	-35°	-25°	-15°	-5°	0°	5°	15°	25°	35°	45°
GSM850(CS)	13mm	on	on	on	on	on	on	on	on	on	on	on
GSM850(1TXS)	13mm	on	on	on	on	on	on	on	on	on	on	on
GSM850(2TXS)	13mm	on	on	on	on	on	on	on	on	on	on	on
GSM850(3TXS)	13mm	on	on	on	on	on	on	on	on	on	on	on
GSM850(4TXS)	13mm	on	on	on	on	on	on	on	on	on	on	on
GSM1900(CS)	13mm	on	on	on	on	on	on	on	on	on	on	on
GSM1900(1TXS)	13mm	on	on	on	on	on	on	on	on	on	on	on
GSM1900(2TXS)	13mm	on	on	on	on	on	on	on	on	on	on	on
GSM1900(3TXS)	13mm	on	on	on	on	on	on	on	on	on	on	on
GSM1900(4TXS)	13mm	on	on	on	on	on	on	on	on	on	on	on
UMTS Band 5	13mm	on	on	on	on	on	on	on	on	on	on	on
LTE Band 5	13mm	on	on	on	on	on	on	on	on	on	on	on
LTE Band 7	13mm	on	on	on	on	on	on	on	on	on	on	on

Conclusion: It can be ensured that the proximity sensor can be valid triggered for the DUT tilt coverage exposure condition (GSM 850/1900, UMTS Band 5,LTE Band 5/7)

7 SAR Measurement Results

7.1 Conducted power measurements

For the measurements a Rohde & Schwarz Radio Communication Tester CMU 200&CMW500 was used.
SAR drift measured at the same position in liquid before and after each SAR test as below 7.2 chapter.

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

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

The signalling modes differ as follows:

mode	coding scheme	modulation
GPRS	CS1 to CS4	GMSK
EDGE	MCS1 to MCS4	GMSK
EDGE	MCS5 to MCS9	8PSK

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

7.1.1 Conducted power measurements of GSM850

GSM850		Tune-up Max.	Burst-Averaged output Power (dBm) 128CH	190CH	251CH	Division Factors	Tune-up Max.	Frame-Averaged output Power (dBm) 128CH	190CH	251CH
GSM (CS)		34.00	32.48	**32.51**	32.49	-9.19	24.81	23.29	23.32	23.30
GPRS/EDGE (GMSK)	1 Tx Slot	34.00	32.50	32.47	32.40	-9.19	24.81	23.31	23.28	23.21
	2 Tx Slots	31.00	29.61	29.69	29.79	-6.13	24.87	23.48	23.56	23.66
	3 Tx Slots	29.50	28.28	28.18	28.04	-4.42	25.08	23.86	23.76	23.62
	4 Tx Slots	28.00	26.77	26.65	26.50	-3.18	24.82	23.59	23.47	23.32
EDGE (8PSK)	1 Tx Slot	28.00	26.00	26.23	26.10	-9.19	18.81	16.81	17.04	16.91
	2 Tx Slots	25.00	22.62	22.85	22.92	-6.13	18.87	16.49	16.72	16.79
	3 Tx Slots	23.50	21.16	21.25	21.37	-4.42	19.08	16.74	16.83	16.95
	4 Tx Slots	22.00	19.53	19.66	19.75	-3.18	18.82	16.35	16.48	16.57

Table 13:Conducted power measurement results of GSM850(Full power)

GSM850		Tune-up Max.	Burst-Averaged output Power (dBm) 128CH	190CH	251CH	Division Factors	Tune-up Max.	Frame-Averaged output Power (dBm) 128CH	190CH	251CH
GPRS/EDGE (GMSK)	1 Tx Slot	**32.90**	**31.37**	**31.31**	**31.22**	**-9.19**	**23.71**	**22.18**	**22.12**	**22.03**
	2 Tx Slots	29.10	27.62	27.72	27.84	-6.13	22.97	21.49	21.59	21.71
	3 Tx Slots	27.20	25.96	25.84	25.68	-4.42	22.78	21.54	21.42	21.26
	4 Tx Slots	25.50	24.17	24.04	23.87	-3.18	22.32	20.99	20.86	20.69
EDGE (8PSK)	1 Tx Slot	28.00	26.00	26.23	26.10	-9.19	18.81	16.81	17.04	16.91
	2 Tx Slots	25.00	22.62	22.85	22.92	-6.13	18.87	16.49	16.72	16.79
	3 Tx Slots	23.50	21.16	21.25	21.37	-4.42	19.08	16.74	16.83	16.95
	4 Tx Slots	22.00	19.53	19.66	19.75	-3.18	18.82	16.35	16.48	16.57

Table 14:Conducted power measurement results of GSM850(Hotspot on+capacitive sensor on/ Hotspot on+capacitive sensor off)

GSM850		Tune-up Max.	Burst-Averaged output Power (dBm) 128CH	190CH	251CH	Division Factors	Tune-up Max.	Frame-Averaged output Power (dBm) 128CH	190CH	251CH
GSM (CS)		33.00	31.36	31.35	31.27	-9.19	23.81	22.17	22.16	22.08
GPRS/EDGE (GMSK)	1 Tx Slot	32.90	31.37	31.31	31.22	-9.19	23.71	22.18	22.12	22.03
	2 Tx Slots	29.10	27.62	27.72	27.84	-6.13	22.97	21.49	21.59	21.71
	3 Tx Slots	27.20	25.96	25.84	25.68	-4.42	22.78	21.54	21.42	21.26
	4 Tx Slots	25.50	24.17	24.04	23.87	-3.18	22.32	20.99	20.86	20.69
EDGE (8PSK)	1 Tx Slot	28.00	26.00	26.23	26.10	-9.19	18.81	16.81	17.04	16.91
	2 Tx Slots	25.00	22.62	22.85	22.92	-6.13	18.87	16.49	16.72	16.79
	3 Tx Slots	23.50	21.16	21.25	21.37	-4.42	19.08	16.74	16.83	16.95
	4 Tx Slots	22.00	19.53	19.66	19.75	-3.18	18.82	16.35	16.48	16.57

Table 15:Conducted power measurement results of GSM850(Receiver off,Hotspot off+capacitive Sensor on)

Note:

1) The conducted power of GSM850 is measured with average detector.

2) Frame-averaged output power was calculated from the measured burst-averaged output power by converting the slot powers into linear units and calculating the energy over 8 timeslots.

3) Per KDB941225 D01, SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

7.1.2 Conducted power measurements of GSM1900

GSM1900		Tune-up	Burst-Averaged output Power (dBm)			Division	Tune-up	Frame-Averaged output Power (dBm)		
		Max.	512CH	661CH	810CH	Factors	Max.	512CH	661CH	810CH
GSM (CS)		31.00	29.85	**29.57**	29.10	-9.19	21.81	20.66	20.38	19.91
GPRS/EDGE (GMSK)	1 Tx Slot	31.00	29.84	29.65	29.12	-9.19	21.81	20.65	20.46	19.93
	2 Tx Slots	28.00	27.25	26.89	26.39	-6.13	21.87	21.12	20.76	20.26
	3 Tx Slots	26.50	25.78	25.38	24.86	-4.42	22.08	21.36	20.96	20.44
	4 Tx Slots	25.00	24.25	23.84	23.30	-3.18	21.82	21.07	20.66	20.12
EDGE (8PSK)	1 Tx Slot	27.00	26.00	25.67	25.06	-9.19	17.81	16.81	16.48	15.87
	2 Tx Slots	24.00	23.07	22.66	21.93	-6.13	17.87	16.94	16.53	15.80
	3 Tx Slots	22.50	21.41	20.93	20.35	-4.42	18.08	16.99	16.51	15.93
	4 Tx Slots	21.00	19.74	19.35	18.75	-3.18	17.82	16.56	16.17	15.57

Table 16:Conducted power measurement results of GSM1900(Full power)

GSM1900		Tune-up	Burst-Averaged output Power (dBm)			Division	Tune-up	Frame-Averaged output Power (dBm)		
		Max.	512CH	661CH	810CH	Factors	Max.	512CH	661CH	810CH
GPRS/EDGE (GMSK)	1 Tx Slot	**25.00**	**23.81**	**23.32**	**22.50**	**-9.19**	**15.81**	**14.62**	**14.13**	**13.31**
	2 Tx Slots	19.40	19.15	18.55	17.74	-6.13	13.27	13.02	12.42	11.61
	3 Tx Slots	16.60	16.54	15.85	14.96	-4.42	12.18	12.12	11.43	10.54
	4 Tx Slots	13.50	13.45	12.92	11.95	-3.18	10.32	10.27	9.74	8.77
EDGE (8PSK)	1 Tx Slot	26.00	25.20	24.67	24.10	-9.19	16.81	16.01	15.48	14.91
	2 Tx Slots	23.00	21.96	21.61	20.96	-6.13	16.87	15.83	15.48	14.83
	3 Tx Slots	21.50	19.95	19.40	19.36	-4.42	17.08	15.53	14.98	14.94
	4 Tx Slots	20.00	18.81	18.22	17.61	-3.18	16.82	15.63	15.04	14.43

Table 17:Conducted power measurement results of GSM1900(Hotspot on+capacitive sensor on/ Hotspot on+capacitive sensor off)

GSM1900		Tune-up	Burst-Averaged output Power (dBm)			Division	Tune-up	Frame-Averaged output Power (dBm)		
		Max.	512CH	661CH	810CH	Factors	Max.	512CH	661CH	810CH
GSM (CS)		25.00	23.84	23.33	22.51	-9.19	15.81	14.65	14.14	13.32
GPRS/EDGE (GMSK)	1 Tx Slot	25.00	23.81	23.32	22.50	-9.19	15.81	14.62	14.13	13.31
	2 Tx Slots	19.40	19.15	18.55	17.74	-6.13	13.27	13.02	12.42	11.61
	3 Tx Slots	16.60	16.54	15.85	14.96	-4.42	12.18	12.12	11.43	10.54
	4 Tx Slots	13.50	13.45	12.92	11.95	-3.18	10.32	10.27	9.74	8.77
EDGE (8PSK)	1 Tx Slot	26.00	25.20	24.67	24.10	-9.19	16.81	16.01	15.48	14.91
	2 Tx Slots	23.00	21.96	21.61	20.96	-6.13	16.87	15.83	15.48	14.83
	3 Tx Slots	21.50	19.95	19.40	19.36	-4.42	17.08	15.53	14.98	14.94
	4 Tx Slots	20.00	18.81	18.22	17.61	-3.18	16.82	15.63	15.04	14.43

Table 18:Conducted power measurement results of GSM1900(Receiver off,Hotspot off+capacitive Sensor on)

Note:

1) The conducted power of GSM1900 is measured with average detector.

2) Frame-averaged output power was calculated from the measured burst-averaged output power by converting the slot powers into linear units and calculating the energy over 8 timeslots.

3) Per KDB941225 D01, SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

7.1.3 Conducted power measurements of UMTS Band 5

UMTS Band 5		Tune-up	Average Power (dBm)		
		Max.	4132CH	4182CH	4233CH
WCDMA	12.2kbps RMC	25.00	23.25	**23.35**	23.32
	12.2kbps AMR	25.00	23.42	23.24	23.28
HSDPA	Subtest 1	24.00	22.39	22.50	22.33
	Subtest 2	24.00	22.13	22.44	22.31
	Subtest 3	23.50	21.64	21.41	21.70
	Subtest 4	23.50	21.63	21.86	21.67
HSUPA	Subtest 1	22.00	20.31	20.43	20.35
	Subtest 2	22.00	20.41	20.38	20.31
	Subtest 3	23.00	21.29	21.42	21.28
	Subtest 4	21.50	19.82	19.95	19.81
	Subtest 5	23.00	21.41	21.53	21.39
DC-HSDPA	Subtest 1	24.00	22.34	22.51	22.37
	Subtest 2	24.00	22.13	22.45	22.34
	Subtest 3	23.50	21.61	21.38	21.70
	Subtest 4	23.50	21.66	21.81	21.65
HSPA+	Subtest 1(UL 16QAM)	22.00	20.38	20.45	20.34

Table 19:Conducted power measurement results of UMTS Band 5(Full power)

UMTS Band 5		Tune-up	Average Power (dBm)		
		Max.	4132CH	4182CH	4233CH
WCDMA	12.2kbps RMC	24.00	22.29	**22.38**	22.30
HSDPA	Subtest 1	23.00	21.35	21.48	21.36
	Subtest 2	23.00	21.29	21.27	21.30
	Subtest 3	22.50	20.74	20.71	20.65
	Subtest 4	22.50	20.79	20.77	20.37
HSUPA	Subtest 1	21.00	19.34	19.41	19.34
	Subtest 2	21.00	19.37	19.43	19.38
	Subtest 3	22.00	20.31	20.45	20.29
	Subtest 4	20.50	18.79	18.89	18.78
	Subtest 5	22.00	20.48	20.55	20.41
DC-HSDPA	Subtest 1	23.00	21.34	21.42	21.36
	Subtest 2	23.00	21.26	21.34	21.33
	Subtest 3	22.50	20.74	20.71	20.62
	Subtest 4	22.50	20.81	20.75	20.37
HSPA+	Subtest 1(UL 16QAM)	21.00	19.45	19.43	19.35

Table 20:Conducted power measurement results of UMTS Band5(Hotspot on+capacitive sensor on/ Hotspot on+capacitive sensor off)

UMTS Band 5		Tune-up	Average Power (dBm)		
		Max.	4132CH	4182CH	4233CH
WCDMA	12.2kbps RMC	24.00	22.29	22.38	22.30
	12.2kbps AMR	24.00	22.17	22.21	22.31
HSDPA	Subtest 1	23.00	21.35	21.48	21.36
	Subtest 2	23.00	21.29	21.27	21.30
	Subtest 3	22.50	20.74	20.71	20.65
	Subtest 4	22.50	20.79	20.77	20.37
HSUPA	Subtest 1	21.00	19.34	19.41	19.34
	Subtest 2	21.00	19.37	19.43	19.38
	Subtest 3	22.00	20.31	20.45	20.29
	Subtest 4	20.50	18.79	18.89	18.78
	Subtest 5	22.00	20.48	20.55	20.41
DC-HSDPA	Subtest 1	23.00	21.34	21.42	21.36
	Subtest 2	23.00	21.26	21.34	21.33
	Subtest 3	22.50	20.74	20.71	20.62
	Subtest 4	22.50	20.81	20.75	20.37
HSPA+	Subtest 1(UL 16QAM)	21.00	19.45	19.43	19.35

Table 21:Conducted power measurement results of UMTS Band5 (Receiver off,Hotspot off+capacitive Sensor on)

Note: 1) The conducted power of UMTS Band 5 is measured with RMS detector.

2) The bolded 12.2kbps RMC mode was selected for SAR testing (the primary mode).

3) Per KDB941225 D01, When the maximum output power and tune-up tolerance specified for production units in a Second 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 Second to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the Second mode.

7.1.4 Conducted power measurements of LTE Band 5

Bandwidth	Modulation	RB size	RB offset	Tune-up Max.	Channel 20407CH	Channel 20525CH	Channel 20643CH
1.4MHz	QPSK	1	0	22.50	20.48	20.32	20.37
		1	3	22.50	20.60	20.52	20.58
		1	5	22.50	20.40	20.39	20.38
		3	0	25.00	22.95	22.87	22.98
		3	2	25.00	22.97	22.89	23.01
		3	3	25.00	22.92	22.88	23.00
		5	0	25.00	22.94	22.93	23.02
		5	1	25.00	22.97	23.04	23.05
		6	0	24.00	22.09	21.93	22.09
	16QAM	1	0	21.50	19.70	19.43	19.70
		1	3	21.50	19.89	19.64	19.90
		1	5	21.50	19.71	19.50	19.68
		5	0	24.00	21.95	22.14	22.03
		5	1	24.00	22.04	21.88	22.13
		3	0	24.00	22.09	21.81	22.08
		3	2	24.00	22.07	21.87	22.13
		3	3	24.00	22.06	21.85	22.11
		6	0	23.00	21.11	20.88	21.03
Bandwidth	Modulation	RB size	RB offset	Tune-up Max.	Channel 20415CH	Channel 20525CH	Channel 20635CH
3MHz	QPSK	1	0	22.50	20.4	20.37	20.47
		1	7	22.50	20.54	20.56	20.61
		1	14	22.50	20.45	20.39	20.47
		4	0	25.00	22.94	22.93	22.97
		4	5	25.00	23.04	23.03	23.05
		4	11	25.00	22.99	22.97	23.04
		8	0	24.00	22.02	21.91	22.05
		8	4	24.00	22.06	21.96	22.13
		8	7	24.00	21.99	21.92	22.07
		15	0	24.00	22.00	21.89	22.07
	16QAM	1	0	21.50	19.85	19.54	19.71
		1	7	21.50	19.89	19.71	19.94
		1	14	21.50	19.83	19.47	19.78
		4	0	24.00	22.04	22.14	22.13
		4	5	24.00	22.04	22.08	22.11
		4	11	24.00	22.01	22.10	22.07
		8	0	23.00	21.06	20.94	21.13
		8	4	23.00	21.07	21.01	21.16
		8	7	23.00	21.03	20.97	21.10
		15	0	23.00	20.98	20.87	21.10

Bandwidth	Modulation	RB size	RB offset	Tune-up Max.	Channel 20425CH	Channel 20525CH	Channel 20625CH
5MHz	QPSK	1	0	22.50	20.49	20.30	20.42
		1	13	22.50	20.50	20.43	20.61
		1	24	22.50	20.48	20.31	20.46
		8	0	25.00	22.98	22.93	22.99
		8	8	25.00	23.04	23.07	23.05
		8	17	25.00	23.01	22.98	23.04
		12	0	24.00	21.93	21.85	21.98
		12	6	24.00	21.96	21.92	22.06
		12	13	24.00	21.95	21.88	22.03
		25	0	24.00	21.97	21.88	22.02
	16QAM	1	0	21.50	19.64	19.84	19.45
		1	13	21.50	19.76	20.04	19.69
		1	24	21.50	19.64	19.88	19.55
		8	0	24.00	22.07	22.02	22.09
		8	8	24.00	22.04	22.14	22.13
		8	17	24.00	22.02	22.06	22.14
		12	0	23.00	20.94	20.91	20.99
		12	6	23.00	21.00	20.92	21.01
		12	13	23.00	20.98	20.87	21.01
		25	0	23.00	20.85	20.87	21.00
Bandwidth	Modulation	RB size	RB offset	Tune-up Max.	Channel 20450CH	Channel 20525CH	Channel 20600CH
10MHz	QPSK	1	0	22.50	20.44	20.43	20.36
		1	25	22.50	**20.60**	20.57	20.59
		1	49	22.50	20.35	20.46	20.47
		12	0	25.00	23.03	22.97	23.00
		12	19	25.00	23.09	22.99	23.10
		12	38	25.00	22.98	22.97	**23.12**
		25	0	24.00	21.99	21.97	22.01
		25	13	24.00	21.99	21.94	22.02
		25	25	24.00	22.00	21.99	**22.04**
		50	0	24.00	21.98	21.96	22.03
	16QAM	1	0	21.50	19.81	19.54	19.62
		1	25	21.50	20.03	19.70	19.86
		1	49	21.50	19.81	19.59	19.75
		12	0	24.00	22.00	22.08	22.03
		12	19	24.00	22.06	22.15	22.12
		12	38	24.00	21.99	22.12	22.16
		25	0	23.00	20.92	21.04	21.00
		25	13	23.00	20.91	21.01	20.99
		25	25	23.00	20.96	21.07	21.02
		50	0	23.00	20.93	20.94	21.03

Table 22:Conducted power measurement results of LTE Band 5(full power)

Bandwidth	Modulation	RB size	RB offset	Tune-up Max.	Channel 20407CH	Channel 20525CH	Channel 20643CH
1.4MHz	QPSK	1	0	21.50	19.51	19.43	19.41
		1	3	21.50	19.66	19.60	19.64
		1	5	21.50	19.46	19.41	19.45
		3	0	24.00	21.97	21.95	22.05
		3	2	24.00	22.01	21.95	22.08
		3	3	24.00	21.98	21.90	22.05
		5	0	24.00	22.03	22.11	22.05
		5	1	24.00	22.02	22.07	22.04
		6	0	24.00	22.07	21.96	22.05
	16QAM	1	0	21.50	19.67	19.47	19.72
		1	3	21.50	19.89	19.70	19.91
		1	5	21.50	19.70	19.48	19.74
		5	0	24.00	22.06	21.98	22.13
		5	1	24.00	22.01	21.94	22.08
		3	0	24.00	22.10	21.84	22.10
		3	2	24.00	22.11	21.89	22.15
		3	3	24.00	22.05	21.88	22.15
		6	0	23.00	21.10	20.89	21.04
Bandwidth	Modulation	RB size	RB offset	Tune-up Max.	Channel 20415CH	Channel 20525CH	Channel 20635CH
3MHz	QPSK	1	0	21.50	19.50	19.46	19.58
		1	7	21.50	19.62	19.64	19.70
		1	14	21.50	19.50	19.45	19.54
		4	0	24.00	21.97	21.93	21.98
		4	5	24.00	22.27	22.11	22.04
		4	11	24.00	22.09	21.89	22.15
		8	0	24.00	22.06	21.94	22.08
		8	4	24.00	22.06	21.98	22.13
		8	7	24.00	22.01	21.94	22.08
		15	0	24.00	22.03	21.92	22.06
	16QAM	1	0	21.50	19.91	19.58	19.77
		1	7	21.50	19.89	19.69	19.97
		1	14	21.50	19.84	19.51	19.77
		4	0	24.00	22.06	21.94	22.08
		4	5	24.00	22.07	22.13	22.04
		4	11	24.00	21.96	21.93	22.01
		8	0	23.00	21.06	20.96	21.14
		8	4	23.00	21.05	21.04	21.19
		8	7	23.00	21.04	20.98	21.11
		15	0	23.00	21.00	20.88	21.14

Bandwidth	Modulation	RB size	RB offset	Tune-up Max.	Channel 20425CH	Channel 20525CH	Channel 20625CH
5MHz	QPSK	1	0	21.50	19.52	19.37	19.48
		1	13	21.50	19.63	19.53	19.71
		1	24	21.50	19.44	19.35	19.58
		8	0	24.00	21.97	21.93	21.98
		8	8	24.00	22.27	22.09	22.04
		8	17	24.00	22.06	21.97	22.01
		12	0	24.00	21.91	21.89	22.00
		12	6	24.00	22.01	21.97	22.06
		12	13	24.00	21.96	21.93	22.06
		25	0	24.00	21.98	21.90	21.98
	16QAM	1	0	21.50	19.69	19.90	19.47
		1	13	21.50	19.81	20.07	19.69
		1	24	21.50	19.65	19.88	19.55
		8	0	24.00	22.08	22.01	22.06
		8	8	24.00	22.11	22.13	22.14
		8	17	24.00	22.10	22.06	22.05
		12	0	23.00	20.90	20.92	20.92
		12	6	23.00	20.99	20.99	21.04
		12	13	23.00	20.98	20.91	20.99
		25	0	23.00	20.90	20.89	21.02
Bandwidth	Modulation	RB size	RB offset	Tune-up Max.	Channel 20450CH	Channel 20525CH	Channel 20600CH
10MHz	QPSK	1	0	21.50	19.47	19.50	19.41
		1	25	21.50	19.64	**19.65**	19.64
		1	49	21.50	19.40	19.52	19.57
		12	0	24.00	22.04	22.01	22.02
		12	19	24.00	22.10	22.04	22.11
		12	38	24.00	22.00	21.98	**22.18**
		25	0	24.00	22.02	21.98	22.03
		25	13	24.00	22.01	21.96	**22.06**
		25	25	24.00	22.01	22.00	22.05
		50	0	24.00	21.97	22.01	22.05
	16QAM	1	0	21.50	19.88	19.56	19.63
		1	25	21.50	20.03	19.78	19.88
		1	49	21.50	19.83	19.60	19.74
		12	0	24.00	22.03	22.00	22.04
		12	19	24.00	22.07	22.11	22.12
		12	38	24.00	22.12	22.15	22.13
		25	0	23.00	20.95	21.08	21.03
		25	13	23.00	20.92	21.04	21.01
		25	25	23.00	20.95	21.09	21.01
		50	0	23.00	20.96	20.96	21.07

Table 23:Conducted power measurement results of LTE Band 5 (Hotspot on+capacitive sensor on/ Hotspot on+ capacitive sensor off/ Hotspot off+ capacitive sensor on)

7.1.1 Conducted power measurements of LTE Band 7

Bandwidth	Modulation	RB size	RB offset	Tune-up Max.	Channel 20775CH	Channel 21100CH	Channel 21425CH
5MHz	QPSK	1	0	22.00	20.53	20.56	20.49
		1	13	22.00	20.66	20.62	20.58
		1	24	22.00	20.56	20.59	20.48
		8	0	24.00	22.54	22.54	22.59
		8	8	24.00	22.56	22.71	22.61
		8	17	24.00	22.61	22.56	22.49
		12	0	23.00	21.55	21.62	21.55
		12	6	23.00	21.59	21.68	21.60
		12	13	23.00	21.54	21.63	21.53
		25	0	23.00	21.58	21.65	21.53
	16QAM	1	0	21.00	19.68	20.06	19.56
		1	13	21.00	19.74	20.13	19.57
		1	24	21.00	19.69	20.04	19.47
		8	0	23.00	21.58	21.61	21.65
		8	8	23.00	21.63	21.63	21.49
		8	17	23.00	21.54	21.68	21.56
		12	0	22.00	20.52	20.60	20.49
		12	6	22.00	20.59	20.69	20.53
		12	13	22.00	20.55	20.59	20.43
		25	0	22.00	20.51	20.58	20.52
Bandwidth	Modulation	RB size	RB offset	Tune-up Max.	Channel 20800CH	Channel 21100CH	Channel 21400CH
10MHz	QPSK	1	0	22.00	20.54	20.67	20.54
		1	25	22.00	20.76	20.79	20.62
		1	49	22.00	20.56	20.69	20.51
		12	0	24.00	22.53	22.54	22.59
		12	19	24.00	22.56	22.69	22.61
		12	38	24.00	22.55	22.57	22.49
		25	0	23.00	21.66	21.70	21.67
		25	13	23.00	21.61	21.71	21.58
		25	25	23.00	21.68	21.70	21.61
		50	0	23.00	21.65	21.66	21.65
	16QAM	1	0	21.00	19.86	19.67	19.81
		1	25	21.00	20.08	19.86	19.85
		1	49	21.00	19.88	19.71	19.68
		12	0	23.00	21.57	21.59	21.61
		12	19	23.00	21.59	22.66	21.49
		12	38	23.00	21.54	21.68	21.57
		25	0	22.00	20.57	20.77	20.60
		25	13	22.00	20.55	20.70	20.59
		25	25	22.00	20.61	20.73	20.57
		50	0	22.00	20.62	20.61	20.64

Bandwidth	Modulation	RB size	RB offset	Tune-up Max.	Channel 20825CH	Channel 21100CH	Channel 21375CH
15MHz	QPSK	1	0	22.00	20.46	20.64	20.57
		1	38	22.00	20.55	20.73	20.61
		1	74	22.00	20.50	20.62	20.47
		16	0	24.00	22.51	22.54	22.56
		16	28	24.00	22.59	22.68	22.61
		16	59	24.00	22.55	22.62	22.49
		36	0	23.00	21.68	21.79	21.69
		36	18	23.00	21.68	21.73	21.63
		36	39	23.00	21.66	21.75	21.62
		75	0	23.00	21.67	21.79	21.67
	16QAM	1	0	21.00	19.84	19.63	19.63
		1	38	21.00	19.88	19.66	19.72
		1	74	21.00	19.86	19.64	19.58
		16	0	23.00	21.57	21.59	21.64
		16	28	23.00	21.61	21.65	21.49
		16	59	23.00	21.54	21.68	21.57
		36	0	22.00	20.57	20.72	20.62
		36	18	22.00	20.61	20.71	20.58
		36	39	22.00	20.67	20.74	20.57
		75	0	22.00	20.65	20.71	20.64
Bandwidth	Modulation	RB size	RB offset	Tune-up Max.	Channel 20850CH	Channel 21100CH	Channel 21350CH
20MHz	QPSK	1	0	22.00	20.34	20.40	20.34
		1	50	22.00	20.65	**20.82**	20.68
		1	99	22.00	20.39	20.44	20.30
		18	0	24.00	22.51	22.54	22.56
		18	41	24.00	**22.62**	**22.69**	**22.66**
		18	82	24.00	22.57	22.62	22.49
		50	0	23.00	21.54	21.65	21.61
		50	25	23.00	21.59	**21.67**	21.63
		50	50	23.00	21.59	21.66	21.61
		100	0	23.00	21.56	**21.68**	21.58
	16QAM	1	0	21.00	19.82	19.51	19.59
		1	50	21.00	20.21	19.87	19.96
		1	99	21.00	19.89	19.57	19.53
		18	0	23.00	21.54	21.60	21.60
		18	41	23.00	21.61	21.63	21.49
		18	82	23.00	21.57	21.68	21.54
		50	0	22.00	20.48	20.58	20.56
		50	25	22.00	20.58	20.57	20.61
		50	50	22.00	20.58	20.59	20.57
		100	0	22.00	20.59	20.59	20.57

Table 24:Conducted power measurement results of LTE Band 7(full power)

Bandwidth	Modulation	RB size	RB offset	Tune-up	Channel	Channel	Channel
				Max.	20775CH	21100CH	21425CH
5MHz	QPSK	1	0	17.50	16.09	16.11	15.98
		1	13	17.50	16.22	16.20	16.09
		1	24	17.50	16.12	16.10	15.98
		8	0	17.50	16.14	16.23	16.17
		8	8	17.50	16.13	16.25	16.19
		8	17	17.50	16.13	16.20	16.09
		12	0	17.50	15.97	16.07	15.91
		12	6	17.50	16.08	16.15	16.01
		12	13	17.50	16.04	16.07	15.91
		25	0	17.50	16.01	16.06	15.93
	16QAM	1	0	17.50	16.21	16.58	16.02
		1	13	17.50	16.34	16.64	16.07
		1	24	17.50	16.21	16.58	15.97
		8	0	17.50	16.38	16.19	16.29
		8	8	17.50	16.61	16.35	16.41
		8	17	17.50	16.38	16.21	16.22
		12	0	17.50	16.01	16.12	15.89
		12	6	17.50	16.12	16.18	16.00
		12	13	17.50	16.06	16.10	15.88
		25	0	17.50	15.99	16.06	15.98
Bandwidth	Modulation	RB size	RB offset	Tune-up	Channel	Channel	Channel
				Max.	20800CH	21100CH	21400CH
10MHz	QPSK	1	0	17.50	16.07	16.21	16.02
		1	25	17.50	16.24	16.33	16.21
		1	49	17.50	16.09	16.24	16.03
		12	0	17.50	16.11	16.20	16.09
		12	19	17.50	16.08	16.21	16.12
		12	38	17.50	16.42	16.17	16.18
		25	0	17.50	16.03	16.10	16.01
		25	13	17.50	16.05	16.13	16.01
		25	25	17.50	16.05	16.11	15.99
		50	0	17.50	16.02	16.09	15.98
	16QAM	1	0	17.50	16.48	16.19	16.27
		1	25	17.50	16.61	16.35	16.41
		1	49	17.50	16.38	16.18	16.22
		12	0	17.50	16.27	16.19	16.03
		12	19	17.50	16.05	16.34	16.07
		12	38	17.50	16.40	16.04	16.14
		25	0	17.50	16.03	16.19	16.04
		25	13	17.50	16.08	16.22	16.03
		25	25	17.50	16.08	16.24	16.01
		50	0	17.50	16.11	16.09	16.06

Bandwidth	Modulation	RB size	RB offset	Tune-up Max.	Channel 20825CH	Channel 21100CH	Channel 21375CH
15MHz	QPSK	1	0	17.50	16.08	16.17	16.12
		1	38	17.50	16.07	16.11	16.03
		1	74	17.50	16.05	16.14	16.07
		16	0	17.50	16.40	16.04	16.14
		16	28	17.50	16.05	16.14	16.07
		16	59	17.50	16.40	16.04	16.14
		36	0	17.50	16.14	16.23	16.17
		36	18	17.50	16.13	16.23	16.17
		36	39	17.50	16.11	16.20	16.09
		75	0	17.50	16.16	16.26	16.13
	16QAM	1	0	17.50	16.42	16.17	16.18
		1	38	17.50	16.42	16.25	16.21
		1	74	17.50	16.44	16.18	16.08
		16	0	17.50	16.13	16.20	16.09
		16	28	17.50	16.01	16.17	16.05
		16	59	17.50	16.08	16.15	16.01
		36	0	17.50	16.12	16.21	16.04
		36	18	17.50	16.12	16.19	16.07
		36	39	17.50	16.10	16.21	15.97
		75	0	17.50	16.11	16.18	16.08
Bandwidth	Modulation	RB size	RB offset	Tune-up Max.	Channel 20850CH	Channel 21100CH	Channel 21350CH
20MHz	QPSK	1	0	17.50	15.90	15.94	15.92
		1	50	17.50	16.29	**16.36**	16.26
		1	99	17.50	15.98	15.99	15.82
		18	0	17.50	16.00	16.09	16.02
		18	41	17.50	16.13	16.17	16.11
		18	82	17.50	16.04	16.08	15.97
		50	0	17.50	15.99	**16.14**	16.06
		50	25	17.50	16.06	16.13	16.03
		50	50	17.50	16.07	16.11	16.03
		100	0	17.50	16.05	16.14	16.07
	16QAM	1	0	17.50	16.40	16.04	16.14
		1	50	17.50	16.70	16.46	16.45
		1	99	17.50	16.46	16.13	16.01
		18	0	17.50	16.14	16.09	16.11
		18	41	17.50	16.25	16.29	16.21
		18	82	17.50	16.08	16.17	16.06
		50	0	17.50	16.07	16.14	16.10
		50	25	17.50	16.10	16.12	16.07
		50	50	17.50	16.10	16.15	16.05
		100	0	17.50	16.11	16.14	16.08

Table 25:Conducted power measurement results of LTE Band 7 (Hotspot on+capacitive sensor on/ Hotspot on+ capacitive sensor off/ Hotspot off+ capacitive sensor on)

7.1.2 Conducted power measurements of WiFi 2.4G

The output power of WiFi antenna is as following:

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11b	1	2412	1Mbps	18.00	17.33	No
	6	2437		18.00	17.27	No
	11	2462		18.00	17.13	No
	12	2467		18.00	17.15	No
	13	2472		18.00	17.26	No
802.11g	1	2412	6Mbps	17.00	15.63	No
	6	2437		17.00	15.28	No
	11	2462		17.00	14.53	No
	12	2467		17.00	15.02	No
	13	2472		17.00	15.22	No
802.11n HT20	1	2412	MCS0	17.00	15.60	No
	6	2442		17.00	15.73	No
	11	2462		17.00	15.57	No
	12	2467		17.00	15.62	No
	13	2472		17.00	15.63	No
802.11n HT40	3	2422	MCS0	15.00	14.18	No
	6	2437		15.00	14.13	No
	9	2452		15.00	12.76	No
	10	2457		15.00	14.18	No
	11	2462		15.00	14.25	No

Table 26:Conducted power measurement results of WiFi 2.4G(MCC of CE countries, receiver off).

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11b	1	2412	1Mbps	18.00	17.24	No
	6	2437		18.00	16.88	No
	11	2462		18.00	**17.52**	Yes
802.11g	1	2412	6Mbps	15.50	13.72	No
	2	2417		17.00	15.50	No
	6	2437		17.00	15.50	No
	10	2457		17.00	16.12	No
	11	2462		15.50	14.59	No
802.11n HT20	1	2412	MCS0	15.50	14.10	No
	2	2417		17.00	15.75	No
	6	2437		17.00	15.72	No
	10	2457		17.00	15.95	No
	11	2462		15.50	14.32	No
802.11n HT40	3	2422	MCS0	13.50	12.10	No
	4	2427		15.00	14.18	No
	6	2437		15.00	13.87	No
	8	2447		15.00	14.05	No
	9	2452		13.50	12.83	No

Table 27:Conducted power measurement results of WiFi 2.4G(MCC of FCC countries, receiver off).

Note: * For this device, WIFI 2.4G 12CH and 13 CH can not be used in FCC countries.

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11b	1	2412	1Mbps	13.00	12.41	No
	6	2437		13.00	12.40	No
	11	2462		13.00	**12.75**	Yea
802.11g	1	2412	6Mbps	13.00	12.33	No
	6	2437		13.00	12.49	No
	11	2462		13.00	12.86	No
802.11n HT20	1	2412	MCS0	13.00	12.35	No
	6	2437		13.00	12.53	No
	11	2462		13.00	12.66	No
802.11n HT40	3	2422	MCS0	13.00	12.17	No
	6	2437		13.00	12.02	No
	9	2452		13.00	12.81	No

Table 28:Conducted power measurement results of WiFi 2.4G(Receiver on).

Note: The Average conducted power of WiFi is measured with RMS detector.

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11b	1	2412	1Mbps	15.00	14.10	No
	6	2437		15.00	14.12	No
	11	2462		15.00	14.56	No
802.11g	1	2412	6Mbps	15.00	14.20	No
	6	2437		15.00	14.16	No
	11	2462		15.00	14.47	No
802.11n HT20	1	2412	MCS0	15.00	13.95	No
	6	2437		15.00	14.19	No
	11	2462		15.00	14.42	No
802.11n HT40	3	2422	MCS0	13.50	12.20	No
	4	1427		15.00	14.20	No
	6	2437		15.00	14.17	No
	8	2447		15.00	14.15	No
	9	2452		13.50	12.79	No

Table 29:Conducted power measurement results of WiFi 2.4G(power level of WIFI and LTE IDC(In-Device Coexistence) mechanism).

Note: The Average conducted power of WiFi is measured with RMS detector.

7.1.3 Conducted power measurements of BT

The output power of BT antenna is as the following:

BT 2450	Tune-up	Average Conducted Power (dBm)		
	Max.	0CH	39CH	78CH
DH5	9.70	7.68	8.03	7.93
2DH5	8.00	5.14	5.43	5.32
3DH5	8.00	5.13	5.43	5.33

BT 2450	Tune-up	Average Conducted Power (dBm)		
	Max.	0CH	19CH	39CH
BT(BLE)	7.00	4.17	4.77	3.95

Table 30: Conducted power measurement results of BT.

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

7.2 SAR measurement Results

General Notes:

1) Per KDB447498 D01, all SAR measurement results are scaled to the maximum tune-up tolerance limit to demonstrate SAR compliance.

2) Per KDB447498 D01, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

● ≤ 0.8W/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.

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

3) Per KDB865664 D01,for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/Kg; if the deviation among the repeated measurement is ≤20%, and the measured SAR <1.45W/Kg, only one repeated measurement is required.

4) Per KDB941225 D06, the DUT Dimension is bigger than 9 cm x 5 cm, so 10mm is chosen as the test separation distance for Hotspot mode. When the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested.

5) Per KDB648474 D04, SAR is evaluated without a headset connected to the device. When the standalone reported body-worn SAR is ≤1.2 W/kg, no additional SAR evaluations using a headset are required.

6) Per KDB865664 D02, SAR plot is only required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination; Plots are also required when the measured SAR is > 1.5 W/kg, or > 7.0 W/kg for occupational exposure. The published RF exposure KDB procedures may require additional plots; for example, to support SAR to peak location separation ratio test exclusion and/or volume scan post-processing (Refer to appendix B for details).

GSM Notes:

1) Per KDB941225 D01, SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

2) Per KDB648474 D04, the device does not support DTM function. Body-worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.

UMTS Notes:

1) Per KDB941225 D01, When the maximum output power and tune-up tolerance specified for production units in a Second 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 Second to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the Second mode.

LTE Notes:

1) The LTE test configurations are determined according to KDB941225 D05 SAR for LTE Devices.The general test procedures used for SAR testing can be found in Section 6.5.

2) A-MPR was disabled for all SAR test by setting NS_01 on the base station simulator.SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames(maximum TTI)

WiFi Notes:

Per KDB248227D01:

1) When reported SAR for the initial test position is ≤ 0.4W/kg, no additional testing for the remaining test position is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8W/kg or all test position are measured. 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..

2) When the DSSS *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.

3) 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 measurement is required for 2.4 GHz 802.11g/n OFDM configurations

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

7.2.1 SAR measurement Result of GSM850

Test Position of Head	Dist.	Test Channel /Freq.(MHz)	Test Mode	Measured SAR(W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
				1-g	10-g						
Left touch	/	190/836.6	GSM	**0.257**	0.198	0.08	32.51	34.00	**0.362**	Battery 1#	Yes
Left tilt	/	190/836.6	GSM	0.139	0.110	-0.10	32.51	34.00	0.196	Battery 1#	/
Right touch	/	190/836.6	GSM	0.241	0.186	-0.01	32.51	34.00	0.340	Battery 1#	/
Right tilt	/	190/836.6	GSM	0.140	0.110	0.01	32.51	34.00	0.197	Battery 1#	/
Left touch	/	190/836.6	GSM	0.241	0.186	-0.10	32.51	34.00	0.340	Battery 2#	/
Left touch	/	190/836.6	GSM	0.237	0.180	0.07	32.51	34.00	0.334	Battery 3#	/

Table 31: Head SAR test results of GSM850

Test Position of Hotspot	Dist.	Test Channel /Freq.(MHz)	Test Mode	Measured SAR(W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
				1-g	10-g						
Front Side	15mm	190/836.6	GSM	0.265	0.202	0.03	32.51	34.00	0.373	Battery 1#	/
Back Side	15mm	190/836.6	GSM	0.374	0.284	-0.04	32.51	34.00	0.527	Battery 1#	/
Back Side	15mm	190/836.6	GSM	**0.483**	0.386	-0.07	32.51	34.00	**0.681**	Battery 2#	Yes
Back Side	15mm	190/836.6	GSM	0.360	0.273	-0.03	32.51	34.00	0.507	Battery 3#	/

Table 32: Body-Worn SAR test results of GSM850

Test Position of Hotspot	Dist.	Test Channel /Freq.(MHz)	Test Mode	Measured SAR(W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
				1-g	10-g						
Front Side	10mm	190/836.6	GPRS 1TS	0.200	0.153	-0.01	31.31	32.90	0.288	Battery 1#	/
Back Side	10mm	190/836.6	GPRS 1TS	0.320	0.245	-0.04	31.31	32.90	0.461	Battery 1#	/
Left Side	10mm	190/836.6	GPRS 1TS	0.187	0.127	-0.08	31.31	32.90	0.270	Battery 1#	/
Right Side	10mm	190/836.6	GPRS 1TS	0.164	0.112	0.00	31.31	32.90	0.237	Battery 1#	/
Bottom Side	10mm	190/836.6	GPRS 1TS	0.030	0.018	-0.05	31.31	32.90	0.044	Battery 1#	/
Back Side	10mm	190/836.6	GPRS 1TS	**0.402**	0.328	-0.08	31.31	32.86	**0.574**	Battery 2#	Yes
Back Side	10mm	190/836.6	GPRS 1TS	0.317	0.242	-0.04	31.31	32.90	0.457	Battery 3#	/

Table 33: Hotspot SAR test results of GSM850

7.2.2 SAR measurement Result of GSM1900

Test Position of Head	Dist.	Test Channel /Freq.(MHz)	Test Mode	Measured SAR(W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
				1-g	10-g						
Left touch	/	661/1880	GSM	0.080	0.053	-0.04	29.57	31.00	0.111	Battery 1#	/
Left tilt	/	661/1880	GSM	0.066	0.041	-0.06	29.57	31.00	0.092	Battery 1#	/
Right touch	/	661/1880	GSM	**0.128**	0.079	0.04	29.57	31.00	**0.178**	Battery 1#	Yes
Right tilt	/	661/1880	GSM	0.044	0.028	-0.06	29.57	31.00	0.061	Battery 1#	/
Right touch	/	661/1880	GSM	0.115	0.072	0.01	29.57	31.00	0.160	Battery 2#	/
Right touch	/	661/1880	GSM	0.110	0.069	-0.02	29.57	31.00	0.153	Battery 3#	/

Table 34: Head SAR test results of GSM1900

Test Position of Body-Worn	Dist.	Test Channel /Freq.(MHz)	Test Mode	Measured SAR(W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
				1-g	10-g						
Front Side	15mm	661/1880	GSM	0.177	0.112	-0.17	29.57	31.00	0.246	Battery 1#	/
Back Side	15mm	661/1880	GSM	0.109	0.065	-0.17	29.57	31.00	0.152	Battery 1#	/
Front Side	15mm	661/1880	GSM	**0.184**	0.116	-0.13	29.57	31.00	**0.256**	Battery 2#	Yes
Front Side	15mm	661/1880	GSM	0.162	0.102	-0.15	29.57	31.00	0.225	Battery 3#	/

Table 35: Body-Worn SAR test results of GSM1900

Test Position of Hotspot	Dist.	Test Channel /Freq.(MHz)	Test Mode	Measured SAR(W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
				1-g	10-g						
Front Side	10mm	661/1880	GPRS 1TS	0.067	0.039	-0.14	23.32	25.00	0.098	Battery 1#	/
Back Side	10mm	661/1880	GPRS 1TS	0.175	0.098	-0.02	23.32	25.00	0.258	Battery 1#	/
Left Side	10mm	661/1880	GPRS 1TS	0.018	0.010	-0.14	23.32	25.00	0.026	Battery 1#	/
Right Side	10mm	661/1880	GPRS 1TS	0.034	0.019	-0.17	23.32	25.00	0.049	Battery 1#	/
Bottom Side	10mm	661/1880	GPRS 1TS	0.230	0.129	-0.16	23.32	25.00	0.339	Battery 1#	/
Bottom Side	10mm	661/1880	GPRS 1TS	0.224	0.126	-0.17	23.32	25.00	0.330	Battery 2#	/
Bottom Side	10mm	661/1880	GPRS 1TS	**0.259**	0.146	-0.17	23.32	25.00	**0.381**	Battery 3#	Yes

Table 36: Hotspot SAR test results of GSM1900

7.2.3 SAR measurement Result of UMTS Band 5

Test Position of Head	Dist.	Test Channel /Freq.(MHz)	Test Mode	Measured SAR(W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
				1-g	10-g						
Left touch	/	4182/836.4	RMC	**0.290**	0.224	-0.19	23.35	25.00	**0.424**	Battery 1#	Yes
Left tilt	/	4182/836.4	RMC	0.165	0.130	-0.02	23.35	25.00	0.241	Battery 1#	/
Right touch	/	4182/836.4	RMC	0.257	0.202	-0.08	23.35	25.00	0.376	Battery 1#	/
Right tilt	/	4182/836.4	RMC	0.160	0.126	0.06	23.35	25.00	0.234	Battery 1#	/
Left touch	/	4182/836.4	RMC	0.267	0.207	-0.05	23.35	25.00	0.390	Battery 2#	/
Left touch	/	4182/836.4	RMC	0.271	0.208	0.01	23.35	25.00	0.396	Battery 3#	/

Table 37: Head SAR test results of UMTS Band 5

Test Position of Body-Worn	Dist.	Test Channel /Freq.(MHz)	Test Mode	Measured SAR(W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
				1-g	10-g						
Front Side	15mm	4182/836.4	RMC	0.124	0.097	0.10	23.35	25.00	0.181	Battery 1#	/
Back Side	15mm	4182/836.4	RMC	0.364	0.292	-0.10	23.35	25.00	0.532	Battery 1#	/
Back Side	15mm	4182/836.4	RMC	**0.391**	0.313	-0.15	23.35	25.00	**0.572**	Battery 2#	Yes
Back Side	15mm	4182/836.4	RMC	0.384	0.309	-0.05	23.35	25.00	0.561	Battery 3#	/

Table 38: Body-Worn SAR test results of UMTS Band 5

Test Position of Hotspot	Dist.	Test Channel /Freq.(MHz)	Test Mode	Measured SAR(W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
				1-g	10-g						
Front Side	10mm	4182/836.4	RMC	0.131	0.097	-0.05	22.38	24.00	0.190	Battery 1#	/
Back Side	10mm	4182/836.4	RMC	**0.340**	0.276	-0.08	22.38	24.00	**0.494**	Battery 1#	Yes
Left Side	10mm	4182/836.4	RMC	0.158	0.105	0.05	22.38	24.00	0.229	Battery 1#	/
Right Side	10mm	4182/836.4	RMC	0.138	0.092	0.07	22.38	24.00	0.200	Battery 1#	/
Bottom Side	10mm	4182/836.4	RMC	0.019	0.012	-0.17	22.38	24.00	0.027	Battery 1#	/
Back Side	10mm	4182/836.4	RMC	0.207	0.159	-0.05	22.38	24.00	0.301	Battery 2#	/
Back Side	10mm	4182/836.4	RMC	0.210	0.161	-0.01	22.38	24.00	0.305	Battery 3#	/

Table 39: Hotspot SAR test results of UMTS Band 5

7.2.4 SAR measurement Result of LTE Band 5

Test Position of Head	Dist.	Test Channel /Freq.(MHz)	Test Mode	Measured SAR(W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
				1-g	10-g						
Left touch	/	20450/829	10M QPSK 1RB#25	0.112	0.087	0.08	20.60	22.50	0.173	Battery 1#	/
Left tilt	/	20450/829	10M QPSK 1RB#25	0.071	0.056	0.06	20.60	22.50	0.110	Battery 1#	/
Right touch	/	20450/829	10M QPSK 1RB#25	0.104	0.081	0.06	20.60	22.50	0.161	Battery 1#	/
Right tilt	/	20450/829	10M QPSK 1RB#25	0.071	0.056	0.11	20.60	22.50	0.110	Battery 1#	/
Left touch	/	20600/844	10M QPSK 12RB#38	**0.280**	0.215	-0.07	23.12	25.00	**0.432**	Battery 1#	Yes
Left tilt	/	20600/844	10M QPSK 12RB#38	0.155	0.120	-0.06	23.12	25.00	0.239	Battery 1#	/
Right touch	/	20600/844	10M QPSK 12RB#38	0.244	0.187	0.13	23.12	25.00	0.376	Battery 1#	/
Right tilt	/	20600/844	10M QPSK 12RB#38	0.148	0.114	-0.01	23.12	25.00	0.228	Battery 1#	/
Left touch	/	20600/844	10M QPSK 50%RB#25	0.164	0.127	0.13	22.04	24.00	0.258	Battery 1#	/
Left tilt	/	20600/844	10M QPSK 50%RB#25	0.102	0.080	0.05	22.04	24.00	0.160	Battery 1#	/
Right touch	/	20600/844	10M QPSK 50%RB#25	0.152	0.118	-0.08	22.04	24.00	0.239	Battery 1#	/
Right tilt	/	20600/844	10M QPSK 50%RB#25	0.102	0.080	0.07	22.04	24.00	0.160	Battery 1#	/
Left touch	/	20600/844	10M QPSK 12RB#38	0.207	0.158	-0.02	23.12	25.00	0.319	Battery 2#	/
Left touch	/	20600/844	10M QPSK 12RB#38	0.211	0.162	0.19	23.12	25.00	0.325	Battery 3#	/

Table 40: Head SAR test results of LTE Band 5

Test Position of Body-Worn	Dist.	Test Channel /Freq.(MHz)	Test Mode	Measured SAR(W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
				1-g	10-g						
Front Side	15mm	20450/829	10M QPSK 1RB#25	0.151	0.117	0.08	20.60	22.50	0.234	Battery 1#	/
Back Side	15mm	20450/829	10M QPSK 1RB#25	0.229	0.135	0.14	20.60	22.50	0.355	Battery 1#	/
Front Side	15mm	20600/844	10M QPSK 12RB#38	0.255	0.199	-0.10	23.12	25.00	0.393	Battery 1#	/
Back Side	15mm	20600/844	10M QPSK 12RB#38	0.256	0.200	0.06	23.12	25.00	0.395	Battery 1#	/
Front Side	15mm	20600/844	10M QPSK 50%RB#25	0.229	0.176	0.02	22.04	24.00	0.360	Battery 1#	/
Back Side	15mm	20600/844	10M QPSK 50%RB#25	**0.290**	0.233	0.00	22.04	24.00	**0.455**	Battery 1#	Yes
Back Side	15mm	20600/844	10M QPSK 50%RB#25	0.254	0.198	0.18	22.04	24.00	0.399	Battery 2#	/
Back Side	15mm	20600/844	10M QPSK 50%RB#25	0.252	0.197	0.08	22.04	24.00	0.396	Battery 3#	/

Table 41: Body-Worn SAR test results of LTE Band 5

Test Position of Hotspot	Dist.	Test Channel /Freq.(MHz)	Test Mode	Measured SAR(W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
				1-g	10-g						
Front Side	10mm	20525/836.5	10M QPSK 1RB#25	0.096	0.078	-0.10	19.65	21.50	0.146	Battery 1#	/
Back Side	10mm	20525/836.5	10M QPSK 1RB#25	0.166	0.135	-0.08	19.65	21.50	0.254	Battery 1#	/
Left Side	10mm	20525/836.5	10M QPSK 1RB#25	0.098	0.072	-0.07	19.65	21.50	0.151	Battery 1#	/
Right Side	10mm	20525/836.5	10M QPSK 1RB#25	0.079	0.058	-0.08	19.65	21.50	0.121	Battery 1#	/
Bottom Side	10mm	20525/836.5	10M QPSK 1RB#25	0.020	0.011	-0.01	19.65	21.50	0.030	Battery 1#	/
Front Side	10mm	20600/844	10M QPSK 12RB#38	0.161	0.127	0.06	22.18	24.00	0.245	Battery 1#	/
Back Side	10mm	20600/844	10M QPSK 12RB#38	0.283	0.223	0.15	22.18	24.00	0.430	Battery 1#	/
Left Side	10mm	20600/844	10M QPSK 12RB#38	0.186	0.129	0.10	22.18	24.00	0.283	Battery 1#	/
Right Side	10mm	20600/844	10M QPSK 12RB#38	0.137	0.091	-0.07	22.18	24.00	0.208	Battery 1#	/
Bottom Side	10mm	20600/844	10M QPSK 12RB#38	0.033	0.020	-0.08	22.18	24.00	0.050	Battery 1#	/
Front Side	10mm	20600/844	10M QPSK 50%RB#13	0.180	0.146	-0.02	22.06	24.00	0.281	Battery 1#	/
Back Side	10mm	20600/844	10M QPSK 50%RB#13	0.336	0.272	-0.18	22.06	24.00	0.525	Battery 1#	/
Left Side	10mm	20600/844	10M QPSK 50%RB#13	0.193	0.141	0.01	22.06	24.00	0.302	Battery 1#	/
Right Side	10mm	20600/844	10M QPSK 50%RB#13	0.075	0.051	-0.02	22.06	24.00	0.118	Battery 1#	/
Bottom Side	10mm	20600/844	10M QPSK 50%RB#13	0.041	0.026	0.03	22.06	24.00	0.063	Battery 1#	/
Back Side	10mm	20600/844	10M QPSK 50%RB#13	**0.349**	0.278	0.06	22.06	24.00	**0.546**	Battery 2#	Yes
Back Side	10mm	20600/844	10M QPSK 50%RB#13	0.345	0.279	-0.14	22.06	24.00	0.539	Battery 3#	/

Table 42: Hotspot SAR test results of LTE Band 5

7.2.5 SAR measurement Result of LTE Band 7

Test Position of Head	Dist.	Test Channel /Freq.(MHz)	Test Mode	Measured SAR(W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
				1-g	10-g						
Left touch	/	21100/2535	20M QPSK 1RB#50	0.036	0.020	-0.18	20.82	22.00	0.047	Battery 1#	/
Left tilt	/	21100/2535	20M QPSK 1RB#50	0.014	0.007	-0.05	20.82	22.00	0.019	Battery 1#	/
Right touch	/	21100/2535	20M QPSK 1RB#50	0.075	0.040	0.06	20.82	22.00	0.098	Battery 1#	/
Right tilt	/	21100/2535	20M QPSK 1RB#50	0.014	0.008	0.08	20.82	22.00	0.019	Battery 1#	/
Left touch	/	21100/2535	20M QPSK 18RB#41	0.046	0.026	-0.13	22.69	24.00	0.063	Battery 1#	/
Left tilt	/	21100/2535	20M QPSK 18RB#41	0.026	0.013	-0.01	22.69	24.00	0.035	Battery 1#	/
Right touch	/	21100/2535	20M QPSK 18RB#41	0.119	0.064	0.00	22.69	24.00	0.161	Battery 1#	/
Right tilt	/	21100/2535	20M QPSK 18RB#41	0.024	0.012	0.09	22.69	24.00	0.032	Battery 1#	/
Left touch	/	21100/2535	20M QPSK 50%RB#25	0.035	0.020	0.04	21.67	23.00	0.048	Battery 1#	/
Left tilt	/	21100/2535	20M QPSK 50%RB#25	0.020	0.010	-0.17	21.67	23.00	0.028	Battery 1#	/
Right touch	/	21100/2535	20M QPSK 50%RB#25	0.096	0.051	0.13	21.67	23.00	0.130	Battery 1#	/
Right tilt	/	21100/2535	20M QPSK 50%RB#25	0.019	0.010	0.19	21.67	23.00	0.026	Battery 1#	/
Right touch	/	21100/2535	20M QPSK 18RB#41	0.115	0.061	0.12	22.69	24.00	0.155	Battery 2#	/
Right touch	/	21100/2535	20M QPSK 18RB#41	**0.122**	0.064	-0.15	22.69	24.00	**0.165**	Battery 3#	Yes

Table 43: Head SAR test results of LTE Band 7

Test Position of Body-Worn	Dist.	Test Channel /Freq.(MHz)	Test Mode	Measured SAR(W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
				1-g	10-g						
Front Side	15mm	21100/2535	20M QPSK 1RB#50	0.163	0.086	-0.14	20.82	22.00	0.214	Battery 1#	/
Back Side	15mm	21100/2535	20M QPSK 1RB#50	0.510	0.274	0.13	20.82	22.00	0.669	Battery 1#	/
Front Side	15mm	21100/2535	20M QPSK 18RB#41	0.259	0.138	-0.10	22.69	24.00	0.350	Battery 1#	/
Back Side	15mm	21100/2535	20M QPSK 18RB#41	**0.765**	0.405	0.17	22.69	24.00	**1.034**	Battery 1#	Yes
Back Side	15mm	20850/2510	20M QPSK 18RB#41	0.644	0.344	0.17	22.62	24.00	0.885	Battery 1#	/
Back Side	15mm	21350/2560	20M QPSK 18RB#41	0.682	0.360	-0.02	22.66	24.00	0.929	Battery 1#	/
Front Side	15mm	21100/2535	20M QPSK 50%RB#25	0.207	0.111	0.11	21.67	23.00	0.281	Battery 1#	/
Back Side	15mm	21100/2535	20M QPSK 50%RB#25	0.465	0.228	0.15	21.67	23.00	0.632	Battery 1#	/
Back Side	15mm	21100/2535	20M QPSK 100%RB#0	0.624	0.328	0.00	21.68	23.00	0.846	Battery 1#	/
Back Side	15mm	21100/2535	20M QPSK 18RB#41	0.698	0.370	-0.05	22.69	24.00	0.944	Battery 2#	/
Back Side	15mm	21100/2535	20M QPSK 18RB#41	0.683	0.360	-0.02	22.69	24.00	0.923	Battery 3#	/

Table 44: Body-Worn SAR test results of LTE Band 7

Test Position of Hotspot	Dist.	Test Channel /Freq.(MHz)	Test Mode	Measured SAR(W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
				1-g	10-g						
Front Side	10mm	21100/2535	20M QPSK 1RB#50	0.135	0.072	-0.11	16.36	17.50	0.176	Battery 1#	/
Back Side	10mm	21100/2535	20M QPSK 1RB#50	**0.418**	0.194	-0.16	16.36	17.50	**0.543**	Battery 1#	Yes
Left Side	10mm	21100/2535	20M QPSK 1RB#50	0.024	0.013	-0.13	16.36	17.50	0.031	Battery 1#	/
Right Side	10mm	21100/2535	20M QPSK 1RB#50	0.032	0.018	-0.12	16.36	17.50	0.041	Battery 1#	/
Bottom Side	10mm	21100/2535	20M QPSK 1RB#50	0.270	0.137	-0.10	16.36	17.50	0.351	Battery 1#	/
Front Side	10mm	21100/2535	20M QPSK 50%RB#0	0.135	0.072	-0.16	16.14	17.50	0.185	Battery 1#	/
Back Side	10mm	21100/2535	20M QPSK 50%RB#0	0.362	0.171	-0.13	16.14	17.50	0.495	Battery 1#	/
Left Side	10mm	21100/2535	20M QPSK 50%RB#0	0.037	0.022	-0.11	16.14	17.50	0.050	Battery 1#	/
Right Side	10mm	21100/2535	20M QPSK 50%RB#0	0.050	0.029	-0.08	16.14	17.50	0.068	Battery 1#	/
Bottom Side	10mm	21100/2535	20M QPSK 50%RB#0	0.271	0.138	-0.09	16.14	17.50	0.371	Battery 1#	/
Back Side	10mm	21100/2535	20M QPSK 1RB#50	0.368	0.174	-0.18	16.36	17.50	0.478	Battery 2#	/
Back Side	10mm	21100/2535	20M QPSK 1RB#50	0.350	0.167	-0.11	16.36	17.50	0.455	Battery 3#	/

Table 45: Hotspot SAR test results of LTE Band 7

7.2.6 SAR measurement Result of WiFi 2.4G

Test Position of Head	Dist.	Test Channel /Freq.(MHz)	Test Mode	Area Scan 1-g SAR (W/kg)	Measured SAR(W/kg)		Power Drift (dB)	Actual duty factor	Scaled 1-g SAR (W/kg)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
					1-g	10-g								
Left touch	/	11/2462	802.11b	0.296	0.242	0.126	-0.02	99%	0.244	12.75	13.00	0.259	Battery 1#	/
Left tilt	/	11/2462	802.11 b	0.292	**0.285**	0.138	0.02	99%	0.288	12.75	13.00	**0.305**	Battery 1#	Yes
Right touch	/	11/2462	802.11 b	0.195	0.180	0.097	-0.02	99%	0.182	12.75	13.00	0.193	Battery 1#	/
Right tilt	/	11/2462	802.11 b	0.188	/	/	0.19	99%	/	12.75	13.00	/	Battery 1#	/
Left tilt	/	11/2462	802.11 b	0.263	0.230	0.114	0.02	99%	0.232	12.75	13.00	0.246	Battery 2#	/
Left tilt	/	11/2462	802.11 b	0.312	0.250	0.127	0.00	99%	0.253	12.75	13.00	0.267	Battery 3#	/

Table 46: Head SAR test results of WiFi 2.4G

WiFi 2.4G	**Tune-up Limit （dBm）**	**Tune-up Limit （mW）**	**Hightest Reported SAR(W/kg)**	**Adjusted SAR (W/kg)**	SAR test
802.11b	13.00	19.95	0.305	/	Yes
802.11g	13.00	19.95	/	0.305	No
802.11n HT20	13.00	19.95	/	0.305	No
802.11n HT40	13.00	19.95	/	0.305	No

Note: Per KDB248227D01, for Head SAR test of WiFi 2.4G, SAR is measured for 2.4 GHz 802.11b DSSS using the initial test position procedure. The highest *reported* SAR for DSSS is adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is < 1.2 W/kg, so SAR for 802.11g/n is not required.

Test Position of Body-Worn	Dist.	Test Channel /Freq.(MHz)	Test Mode	Area Scan 1-g SAR（W/kg）	Measured SAR(W/kg)		Power Drift (dB)	Actual duty factor	Scaled 1-g SAR (W/kg)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
					1-g	10-g								
Front Side	15mm	11/2462	802.11 b	0.118	/	/	-0.12	99%	/	17.52	18.00	/	Battery 1#	/
Back Side	15mm	11/2462	802.11 b	0.126	**0.136**	0.085	-0.05	99%	0.137	17.52	18.00	**0.153**	Battery 1#	Yes
Back Side	15mm	11/2462	802.11 b	0.068	0.078	0.043	-0.05	99%	0.079	17.52	18.00	0.088	Battery 2#	/
Back Side	15mm	11/2462	802.11 b	0.077	0.075	0.042	-0.16	99%	0.075	17.52	18.00	0.084	Battery 3#	/

Table 47: Body-Worn SAR test results of WiFi 2.4G

WiFi 2.4G	**Tune-up Limit（dBm）**	**Tune-up Limit（mW）**	**Hightest Reported SAR(W/kg)**	Adjusted SAR (W/kg)	SAR test
802.11b	18.00	63.10	0.153	/	Yes
802.11g	17.00	50.12	/	0.122	No
802.11n HT20	17.00	50.12	/	0.122	No
802.11n HT40	15.00	31.62	/	0.077	No

Note: Per KDB248227D01, for Head SAR test of WiFi 2.4G, SAR is measured for 2.4 GHz 802.11b DSSS using the initial test position procedure. The highest *reported* SAR for DSSS is adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is < 1.2 W/kg, so SAR for 802.11g/n is not required.

Test Position of Hotspot	Dist.	Test Channel /Freq.(MHz)	Test Mode	Area Scan 1-g SAR（W/kg）	Measured SAR(W/kg)		Power Drift (dB)	Actual duty factor	Scaled 1-g SAR (W/kg)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
					1-g	10-g								
Front Side	10mm	11/2462	802.11 b	0.178	0.191	0.115	-0.02	99%	0.193	17.52	18.00	0.215	Battery 1#	/
Back Side	10mm	11/2462	802.11 b	0.223	**0.252**	0.136	0.03	99%	**0.255**	17.52	18.00	**0.284**	Battery 1#	Yes
Right Side	10mm	11/2462	802.11 b	0.126	/	/	-0.08	99%	/	17.52	18.00	/	Battery 1#	/
Top Side	10mm	11/2462	802.11 b	0.171	/	/	-0.19	99%	/	17.52	18.00	/	Battery 1#	/
Back Side	10mm	11/2462	802.11 b	0.221	0.217	0.119	-0.07	99%	0.219	17.52	18.00	0.245	Battery 2#	/
Back Side	10mm	11/2462	802.11 b	0.202	0.199	0.113	0.03	99%	0.201	17.52	18.00	0.225	Battery 3#	/

Table 48: Hotspot SAR test results of WiFi 2.4G

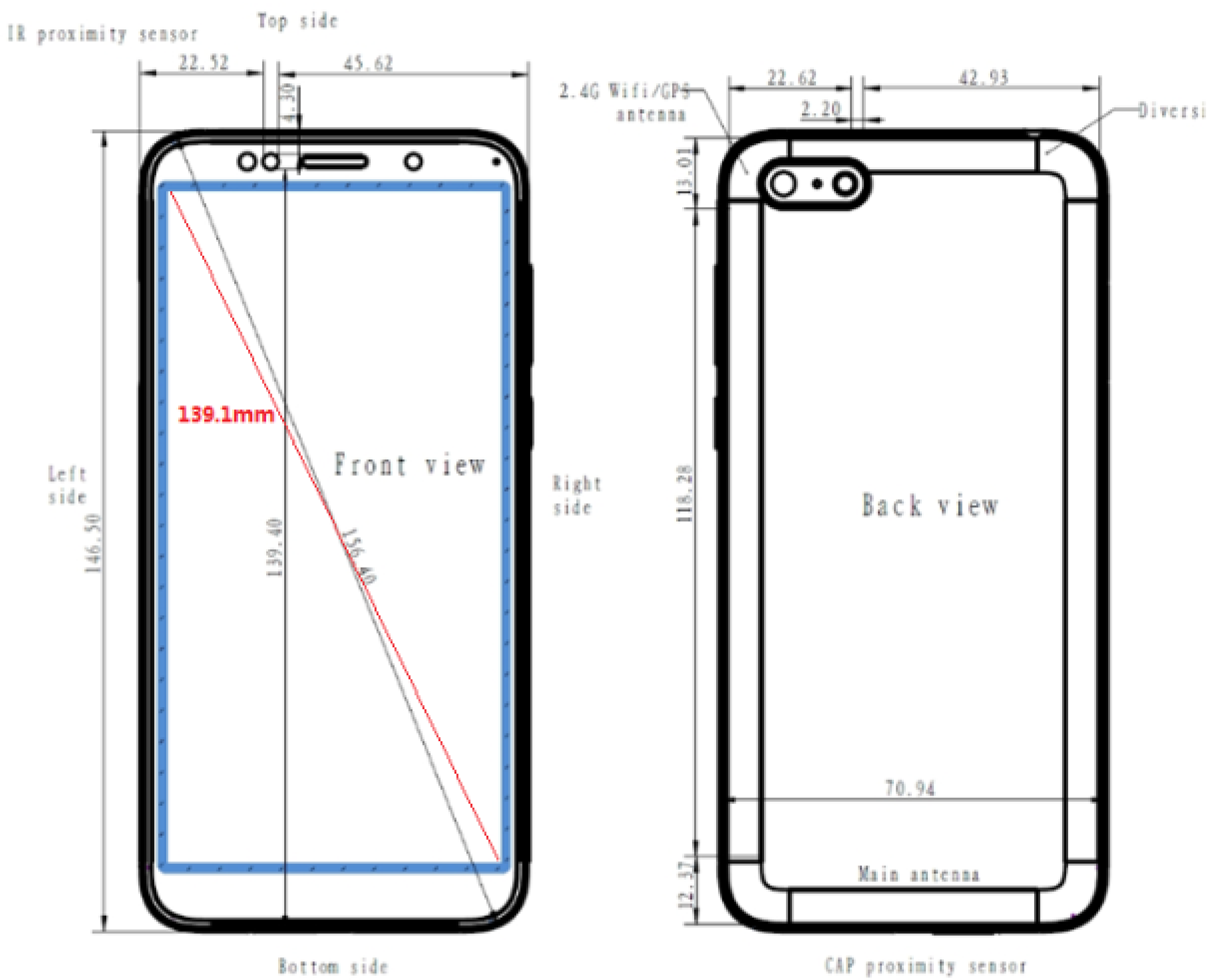
WiFi 2.4G	**Tune-up Limit（dBm）**	**Tune-up Limit（mW）**	**Hightest Reported SAR(W/kg)**	Adjusted SAR (W/kg)	SAR test
802.11b	18.00	63.10	0.284	/	Yes
802.11g	17.00	50.12	/	0.226	No
802.11n HT20	17.00	50.12	/	0.226	No
802.11n HT40	15.00	31.62	/	0.142	No

Note: Per KDB248227D01, for Head SAR test of WiFi 2.4G, SAR is measured for 2.4 GHz 802.11b DSSS using the initial test position procedure. The highest *reported* SAR for DSSS is adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is < 1.2 W/kg, so SAR for 802.11g/n is not required.

7.3 Multiple Transmitter Evaluation

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

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



Note:

1) Diversity antenna is used to improve the acceptance of performance of the main antenna. it does not have a transmitter function.
2) Per KDB 648474 D04, because the diagonal distance of this device is < 160mm and the diagonal dimension of display is <150mm, it is not a phablet .

Mode	Exposure Condition	Front Side	Back Side	Left Side	Right Side	Top Side	Bottom Side
Main antenna	Hotspot	Yes	Yes	Yes	Yes	No	Yes
WiFi 2.4G/BT antenna	Hotspot	Yes	Yes	No	Yes	Yes	No

Table 49: Sides for Hotspot SAR testing

Note:

1) Per KDB 941225 D06 and KDB 648474 D04, particular DUT edges were not required to be evaluated for Hotspot and/or Product Specific SAR if the antenna-to-edge distance is greater than 2.5cm.

7.3.1 Stand-alone SAR test exclusion

Per FCC KDB 447498D01, the 1-g SAR and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for Product Specific 10-g SAR SAR, where:

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

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

Mode	Position	P_{max} (dBm)*	P_{max} (mW)	Distance (mm)	f (GHz)	Calculation Result	SAR Exclusion threshold	SAR test exclusion
BT	Head	9.70	9.33	5	2.480	2.94	3.00	No
BT	Body-worn	9.70	9.33	15	2.480	0.98	3.00	No
BT	Hotspot	9.70	9.33	10	2.480	1.47	3.00	No

Table 50: Standalone SAR test exclusion for BT

Note:

1)* - maximum possible output power declared by manufacturer

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] • [√ f(GHz)/x] W/kg for test separation distances ⩽ 50 mm,where x = 7.5 for 1-g SAR and x = 18.75 for 10-g SAR.

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

Mode	Position	P_{max} (dBm)*	P_{max} (mW)	Distance (mm)	f (GHz)	X	Estimated SAR (W/Kg)*
BT	Head	9.70	9.33	5	2.480	7.50	0.392
BT	Body-worn	9.70	9.33	15	2.480	7.50	0.131
BT	Hotspot	9.70	9.33	10	2.480	7.50	0.196

Table 51: Estimated SAR calculation for BT

Note:

1) * - maximum possible output power declared by manufacturer

7.3.2 Simultaneous Transmission Possibilities

The Simultaneous Transmission Possibilities of this device are as below:

NO.	Simultaneous Tx Combination	Head	Body-worn	Hotspot (10mm)
1	GSM Voice(Main ant) + BT	Yes	Yes	NA
2	GSM DATA(Main ant) + BT	N/A	Yes	Yes
3	GSM Voice(Main ant) + WiFi	Yes	Yes	NA
4	GSM DATA(Main ant) + WiFi	N/A	Yes	Yes
5	UMTS (Main ant) + BT	Yes	Yes	Yes
6	UMTS (Main ant) + WiFi	Yes*	Yes	Yes
7	LTE(Main ant) + WiFi	Yes*	Yes*	Yes
8	LTE(Main ant) + BT	Yes*	Yes*	Yes

Table 52: Simultaneous Transmission Possibilities

Note:

1) WiFi and Bluetooth share the same Tx antenna and can't transmit simultaneously.

2) The device does not support DTM function.

3) * VoLTE or pre-installed VOIP applications are considered.

7.3.3 SAR Summation Scenario

Test Position		Main antenna SARMax					WiFi/BT antenna SARMax		Σ1-g SAR (1.6W/kg Limit)
		GSM850	GSM1900	UMTS B5	LTE B5	LTE B7	WiFi 2.4G	BT	
Head	Left touch	0.362	0.111	0.424	0.423	0.063	0.259	0.392	0.824
	Left tilt	0.196	0.092	0.241	0.239	0.035	0.305	0.392	0.633
	Right touch	0.340	0.178	0.376	0.376	0.165	0.193	0.392	0.768
	Right tilt	0.197	0.061	0.234	0.228	0.032	0.305	0.392	0.626
Body Worn	Front Side	0.373	0.256	0.181	0.393	0.350	0.153	0.131	0.546
	Back Side	0.681	0.152	0.572	0.455	1.034	0.153	0.131	**1.187**
Hotspot	Front Side	0.288	0.098	0.190	0.281	0.185	0.215	0.196	0.503
	Back Side	0.574	0.258	0.494	0.546	0.543	0.284	0.196	0.858
	Left Side	0.270	0.026	0.229	0.302	0.050	/	/	0.302
	Right Side	0.237	0.049	0.200	0.208	0.068	0.284	0.196	0.521
	Top Side	/	/	/	/	/	0.284	0.196	0.284
	Bottom Side	0.044	0.381	0.027	0.063	0.371	/	/	0.381

Table 53: 1-g SAR Simultaneous Tx Combination of 2G/3G/4G Antenna and WiFi/BT Antenna.

7.3.4 Simultaneous Transmission Conlcusion

The above numeral summed SAR results and SPLSR analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore simultaneous transmission SAR with Volume Scans is not required per KDB 447498 D01.

Appendix A. System Check Plots

(Please3 See Appendix No.: SYBH(Z-SAR)20180212006002-2A, total: 13 pages)

Appendix B. SAR Measurement Plots

(Please See Appendix No.: SYBH(Z-SAR)20180212006002-2B, total: 19 pages)

Appendix C. Calibration Certificate

(Please See Appendix No.: SYBH(Z-SAR) 20180212006002-2C, total: 95 pages)

Appendix D. Photo documentation

(Please See Appendix No.: SYBH(Z-SAR) 20180212006002-2D, total: 6 pages)

End