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FCC SAR Compliance Test Report

Product Name: Smart Phone

Model: H710VL, H1622

Report No.: SYBH(Z-SAR)008062016-2

FCC ID: QISKIW-A2

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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.

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※ ※ Modified History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	2016-07-14	Shen Peng
Rev.1.1	Section 1.1, 7.1.5, 7.2.5 and 7.3.3: Update LTE B13 tune-up limit.Update the reported SAR of LTE B13 accordingly.	2016-07-21	Shen Peng

1 General Information

1.1 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for H710VL, H1622 is as below Table 1.

Band	Max Reported SAR(W/kg)			
	1-g Head SAR	1-g Body-worn SAR (15mm) *	1-g Hotspot SAR (10mm)	product specific 10-g SAR (0mm)**
CDMA BC0	0.34	0.36	0.62	/
CDMA BC1	0.54	0.41	**1.11**	/
LTE Band II	0.46	0.40	0.78	/
LTE Band IV	0.38	**0.44**	0.83	/
LTE Band XIII	0.28	0.37	0.47	/
WiFi 2.4G	**0.88**	0.06	0.33	/
BT	/	/	/	/
The highest simultaneous SAR value is 1.42 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)** For product specific 10-g operation, this device has been tested and meets the 10-g SAR limits of 4.0 W/kg for general population/ uncontrolled exposure according to ANSI C95.1:1992/IEEE C95.1:1991 and Industry Canada Radio Standards Specification RSS-102.

The device is in compliance with Specific Absorption Rate（SAR）for general population/uncontraolled 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, according to the Industry Canada Radio Standards Specification RSS-102 for General Population/Uncontrolled exposure, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013.

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.

1.3 EUT Description

Device Information：			
Product Name:	Smart Phone		
Model:	H710VL, H1622		
FCC ID :	QISKIW-A2		
SN No.:	XLM0116427000077 XLM0116427000473		
Device Type :	Portable device		
Device Phase:	Identical Prototype		
Exposure Category:	Uncontrolled environment / general population		
Hardware Version :	HL1H710VLMAA		
Software Version :	H710VLC378B010		
Antenna Type :	Internal antenna		
Others Accessories	Headset		
Device Operating Configurations:			
Supporting Mode(s)	CDMA BC0/BC1, LTE Band II/IV/XIII, WiFi 2.4G, BT		
Test Modulation	CDMA(QPSK),LTE(QPSK/16QAM),WiFi(DSSS/OFDM),BT(GFSK)		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	CDMA BC0	824-849	869-894
	CDMA BC1	1850-1910	1930-1990
	LTE Band II	1850 -1910	1930 -1990
	LTE Band IV	1710 -1755	2110 -2155
	LTE Band XVII	777-787	746-756
	BT	2412-2462	
	WiFi 2.4G	2402-2480	
Power Class:	3, tested with power control "all Up".(CDMA BC0)		
	3, tested with power control "all Up".(CDMA BC1)		
	3, tested with power control all Max.(LTE Band II)		
	3, tested with power control all Max.(LTE Band IV)		
	3, tested with power control all Max.(LTE Band XIII)		
Test Channels (low-mid-high):	1013-384-777(CDMA BC0)		
	25-600-1175(CDMA BC1)		
	18607-18900-19193(LTE Band II BW=1.4MHz)		
	18615-18900-19185(LTE Band II BW=3MHz)		
	18625-18900-19175(LTE Band II BW=5MHz)		
	18650-18900-19150(LTE Band II BW=10MHz)		
	18675-18900-19125(LTE Band II BW=15MHz)		
	18700-18900-19100(LTE Band II BW=20MHz)		
	19957-20175-20393(LTE Band IV BW=1.4MHz)		
	19965-20175-20385(LTE Band IV BW=3MHz)		
	19975-20175-20375(LTE Band IV BW=5MHz)		
	20000-20175-20350(LTE Band IV BW=10MHz)		
	20025-20175-20325(LTE Band IV BW=15MHz)		
	20050-20175-20300(LTE Band IV BW=20MHz)		
	23205-23230-23255(LTE Band XIII BW=5MHz)		
	23230(LTE Band XIII BW=10MHz)		
	802.11b/g/n 20M:1-6-11 (WiFi 2.4G)		

Table 3:Device information and operating configuration

1.3.1 General Description

H710VL, H1622 is subscriber equipment in the CDMA/LTE system. The frequency band is CDMA BC0 (Cell 800) and BC1 (PCS1900). The LTE frequency band is B2 and B4 and B13. all test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, CDMA2000 1x /1X EV-DO and LTE protocol processing, voice, MMS service, GPS, AGPS 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.

Model	**H710VL**	**H1622**
FCC ID	QISKIW-A2	QISKIW-A2
Frequency	the same	the same
PCB	the same	the same
Hardware Version	the same	the same
Software Version	different	different
Dimensions	the same	the same
Appearance	the same	the same
antenna	the same	the same
Others	the same	the same

Battery information:

Name	Manufacture	Serials number	Description
Li-Polymer Battery	Sunwoda Electronic Co., LTD	NA	Battery Model: HB396481EBC Rated capacity: 3000mAh Nominal Voltage: ⎓ +3.8V

1.3.2 Power reduction specification

This device uses a single fixed level of power reduction through static table look-up for SAR compliance and it is triggered by a single event or operation. An infrared proximity sensor is used to reduce the output power of Wi-Fi antenna when Wi-Fi and 2G&3G&4G main antenna voice mode transmit simultaneously in held-to-ear scenario.
The similar SAR procedures in FCC KDB 616217D04 section 6 for determining proximity sensor triggering distances are applied(Refer to Section 6.1.6 for details).

The following tables summerize the key power reduction information.The detailed full power and reduced tune-up specifications and conducted power measurement results are provided in Section 7 of this report. The PAG requirements can be excluded per KDB 388624D02.

2G&3G&4G Main antenna(Voice) + WiFi antenna simultaneous transmission		
Band	Power Reduction Level Amount (dB)	
	Main Antenna(Voice) + WiFi +Sensor on	Main Antenna(Voice) +WiFi +Sensor off
WIFI 2.4G 802.11b	3	0
WIFI 2.4G 802.11g	1	0
WIFI 2.4G 802.11n	0	0

1.4 Test specification(s)

ANSI C95.1:1992	Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.(IEEE Std C95.1-1991)
IEEE Std 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
RSS-102	Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands (Issue 5 of March 2015)
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	SAR 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

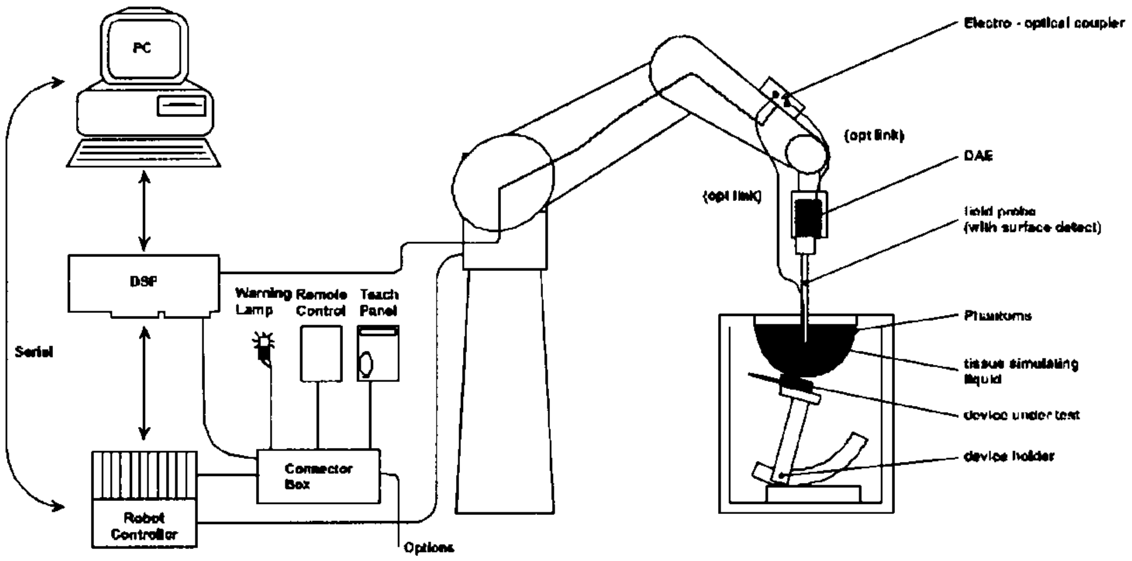
Start Date of test	2016-06-14
End Date of test	2016-06-30

1.8 Ambient Condition

Ambient temperature	20°C – 24°C
Relative Humidity	30% – 70%

2 SAR Measurement System

2.1 SAR Measurement Set-up



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

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

2.2 Test environment

The DASY5 measurement system is placed at the head end of a room with dimensions:
5 x 2.5 x 3 m^3, 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 m^2 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

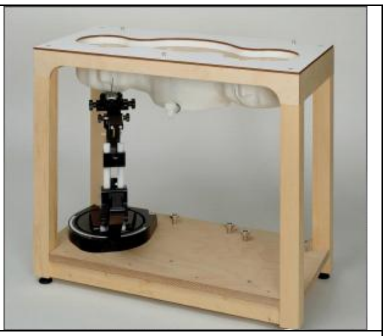
Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	 
Calibration	ISO/IEC 17025 calibration service available.	
Frequency	10 MHz to 4 GHz; Linearity: ± 0.2 dB (30 MHz to 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%	

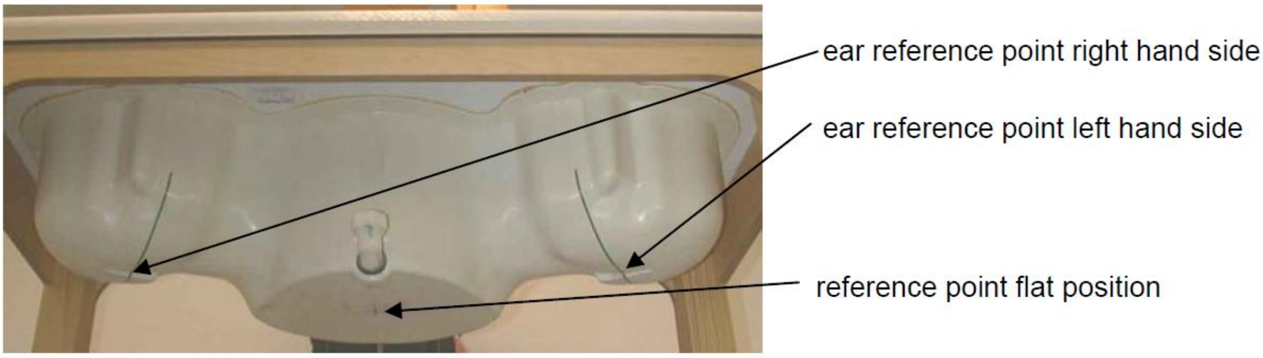
2.5 Phantom description

SAM Twin Phantom

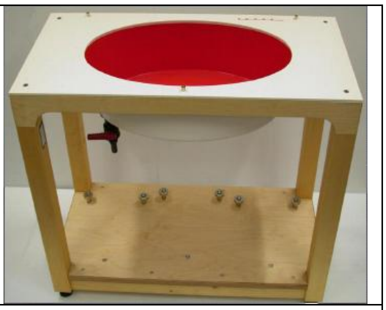
Shell Thickness	2mm±0.2mm;The ear region:6.0±0.2mm	
Filling Volume	Approximately 25 liters	
Dimensions	Length:1000mm; Width:500mm; Height: adjustable feet	
Measurement Areas	Left hand Right hand Flat phantom	

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≤εr≤5 at ≤3 GHz,3≤ εr≤4 at >3 GHz and and a loss tangent ≤0.05.

2.6 Device holder description

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

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	7381	2015-10-30	One year
☒	SPEAG	Dosimetric E-Field Probe	EX3DV4	3744	2015-07-24	One year
☒	SPEAG	750MHz Dipole	D750V3	1044	2015-09-14	Three years
☒	SPEAG	835MHz Dipole	D835V2	4d059	2016-04-20	Three years
☒	SPEAG	1750MHz Dipole	D1750V2	1123	2016-02-02	Three years
☒	SPEAG	1900MHz Dipole	D1900V2	5d091	2015-09-21	Three years
☒	SPEAG	2450MHz Dipole	D2450V2	860	2016-02-08	Three years
☐	SPEAG	2600MHz Dipole	D2600V2	1021	2015-07-24	Three years
☐	SPEAG	5GHz Dipole	D5GHzV2	1155	2015-04-27	Three years
☒	SPEAG	Data acquisition electronics	DAE4	1236	2015-10-22	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
☐	SPEAG	Twin Phantom	SAM5	TP-1894	NCR	NCR
☐	SPEAG	Twin Phantom	SAM6	TP-1892	NCR	NCR
☒	R & S	Universal Radio Communication Tester	CMU 200	113989	2016-05-12	One year
☒	R & S	Universal Radio Communication Tester	CMW 500	126855	2015-07-02	One year
☒	Agilent	Network Analyser	E5071C	MY46213349	2016-01-08	One year
☒	Agilent	Dielectric Probe Kit	85070E	2484	NCR	NCR
☒	Agilent	Signal Generator	N5181A	MY47420989	2015-10-30	One year
☒	MINI-CIRCUITS	Amplifier	ZHL-42W	QA1402001	NCR	NCR
☒	AR	Directional Coupler	DC7144M1	0423264	2016-04-07	One year
☒	R & S	Power Meter	NRP	100740	2015-07-02	One year
☒	R & S	Power Meter Sensor	NRP-Z11	106288	2015-07-02	One year
☒	Agilent	Power Meter	E4417A	MY45101339	2016-01-06	One year
☒	Agilent	Power Meter Sensor	E9321A	MY44420359	2016-01-06	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) *All the equipments are within the valid period when the tests are performed.

3 SAR Measurement Procedure

3.1 Scanning procedure

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

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

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

- The “area scan” measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field 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}, $\Delta y_{zoom} \leq$ 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*$\Delta z_{Zoom}(n-1)$	≥30mm
2-3GHz	≤12mm	≤5mm	≤5mm	≤4mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥30mm
3-4GHz	≤12mm	≤5mm	≤4mm	≤3mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥28mm
4-5GHz	≤10mm	≤4mm	≤3mm	≤2.5mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥25mm
5-6GHz	≤10mm	≤4mm	≤2mm	≤2mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥22mm

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

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

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

Data Evaluation by SEMCAD

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

Probe parameters:	- Sensitivity	$Norm_i$, 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 DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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

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

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

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

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

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

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

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

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

ConvF = sensitivity enhancement in solution

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.

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

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.

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

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

E_{tot} = total 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**	2300	**2450**	2600
Water	39.2	41.45	52.64	55.242	62.82	62.7	55.242
Salt (NaCl)	2.7	1.45	0.36	0.306	0.51	0.5	0.306
Sugar	57.0	56.0	0.0	0.0	0.0	0.0	0.0
HEC	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Bactericide	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DGBE	0.0	0.0	47.0	44.542	36.67	36.8	44.452
Ingredients (% of weight)	**Body Tissue**						
Frequency Band (MHz)	**750**	**835**	**1750**	**1900**	2300	**2450**	2600
Water	50.3	52.4	69.91	69.91	73.32	73.2	64.493
Salt (NaCl)	1.60	1.40	0.13	0.13	0.06	0.04	0.024
Sugar	47.0	45.0	0.0	0.0	0.0	0.0	0.0
HEC	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Bactericide	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DGBE	0.0	0.0	29.96	29.96	26.62	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 for 5G(HBBL3500-5800MHz), Manufactured by SPEAG:**

Ingredients	(% by weight)
Water	50-65%
Mineral oil	10-30%
Emulsifiers	8-25%
Sodium salt	0-1.5%

☐ **Simulating Body Liquid for 5G(MBBL3500-5800MHz),Manufactured by SPEAG:**

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

Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue		Deviation (Within +/-5%)		Liquid Temp.	Test Date
		εr	σ (S/m)	εr	σ (S/m)	$\Delta\varepsilon_r$	Δσ		
750H	705	42.14	0.89	43.10	0.859	2.28%	-3.54%	21.4°C	2016/6/22
	710	42.11	0.89	43.02	0.864	2.16%	-2.94%		
	750	41.90	0.89	42.45	0.883	1.31%	-0.76%		
750B	705	55.70	0.96	53.94	0.92	-3.16%	-4.01%	21.4°C	2016/6/22
	710	55.70	0.96	54.01	0.93	-3.03%	-3.55%		
	750	55.50	0.96	53.59	0.98	-3.44%	1.80%		
835H	825	41.60	0.90	40.29	0.892	-3.15%	-0.93%	21.4°C	2016/6/30
	835	41.50	0.90	40.20	0.899	-3.13%	-0.16%		
	850	41.50	0.92	40.08	0.910	-3.42%	-1.09%		
835B	825	55.20	0.97	53.64	0.98	-2.83%	0.58%	21.4°C	2016/6/29
	835	55.20	0.97	53.53	0.99	-3.03%	1.60%		
	850	55.20	0.99	53.35	1.00	-3.35%	1.11%		
1750H	1710	40.10	1.35	39.92	1.317	-0.45%	-2.44%	21.4°C	2016/6/22
	1730	40.10	1.36	39.83	1.342	-0.67%	-1.32%		
	1750	40.10	1.37	39.74	1.365	-0.90%	-0.36%		
	1800	40.00	1.40	39.49	1.415	-1.28%	1.07%		
1750B	1710	53.50	1.46	52.30	1.39	-2.24%	-4.93%	21.0°C	2016/6/17
	1730	53.50	1.48	52.24	1.41	-2.36%	-4.80%		
	1750	53.40	1.49	52.16	1.43	-2.32%	-4.09%		
	1800	53.30	1.52	51.92	1.48	-2.59%	-2.50%		
1900H	1850	40.00	1.40	40.13	1.378	0.33%	-1.57%	21.4°C	2016/6/17
	1880	40.00	1.40	39.97	1.406	-0.08%	0.43%		
	1900	40.00	1.40	39.96	1.422	-0.10%	1.57%		
	1910	40.00	1.40	39.88	1.433	-0.30%	2.36%		
1900H	1850	40.00	1.40	39.77	1.354	-0.57%	-3.29%	21.4°C	2016/6/27
	1880	40.00	1.40	39.65	1.385	-0.88%	-1.07%		
	1900	40.00	1.40	39.57	1.406	-1.08%	0.43%		
	1910	40.00	1.40	39.51	1.416	-1.23%	1.14%		
1900B	1850	53.30	1.52	51.37	1.52	-3.62%	-0.26%	21.0°C	2016/6/16
	1880	53.30	1.52	51.26	1.55	-3.83%	1.91%		
	1900	53.30	1.52	51.19	1.57	-3.96%	3.22%		
	1910	53.30	1.52	51.15	1.58	-4.03%	4.01%		
1900B	1850	53.30	1.52	52.38	1.50	-1.73%	-1.58%	21.0°C	2016/6/29
	1880	53.30	1.52	52.28	1.53	-1.91%	0.66%		
	1900	53.30	1.52	52.22	1.55	-2.03%	1.91%		
	1910	53.30	1.52	52.18	1.56	-2.10%	2.63%		
2450H	2410	39.30	1.76	39.29	1.806	-0.03%	2.61%	21.4°C	2016/6/15
	2435	39.20	1.79	39.21	1.833	0.03%	2.40%		
	2450	39.20	1.80	39.15	1.849	-0.13%	2.72%		
	2460	39.20	1.81	39.11	1.861	-0.23%	2.82%		

2450B	2410	52.80	1.91	52.32	1.96	-0.91%	2.41%	21.0°C	2016/6/25
	2435	52.70	1.94	52.24	1.99	-0.87%	2.58%		
	2450	52.70	1.95	52.19	2.01	-0.97%	2.97%		
	2460	52.70	1.96	52.15	2.02	-1.04%	3.01%		
ε_r= Relative permittivity, σ= Conductivity									

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 P1528 (described above). The following table shows system check results for all frequency bands and tissue liquids used during the tests(Graphic Plot(s) see Appendix A).

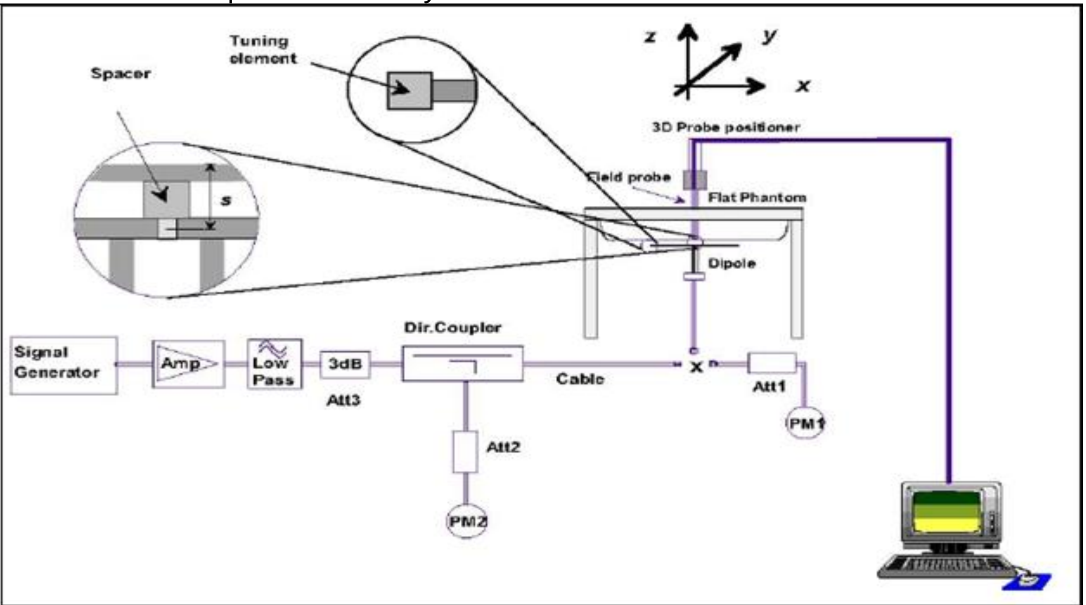
System Check	Target SAR (1W)		Measured SAR (Normalized to 1W)		Deviation (Within +/-10%)		Liquid Temp.	Test Date
	1-g (W/kg)	10-g (W/kg)	1-g (W/kg)	10-g (W/kg)	Δ1g	Δ10g		
750MHz Head	8.12	5.33	8.24	5.36	1.48%	0.56%	21.4°C	2016/6/22
835MHz Head	9.30	6.05	10.12	6.60	8.82%	9.09%	21.4°C	2016/6/30
1750MHz Head	35.10	18.60	37.12	19.92	5.75%	7.10%	21.4°C	2016/6/22
1900MHz Head	40.20	21.10	39.84	20.44	-0.90%	-3.13%	21.4°C	2016/6/17
1900MHz Head	40.20	21.10	42.00	21.64	4.48%	2.56%	21.4°C	2016/6/27
2450MHz Head	50.80	23.70	51.20	23.52	0.79%	-0.76%	21.4°C	2016/6/15
750MHz Body	8.76	5.78	8.96	5.84	2.28%	1.04%	21.0°C	2016/6/22
835MHz Body	9.41	6.20	9.44	6.16	0.32%	-0.65%	21.0°C	2016/6/29
1750MHz Body	36.30	19.50	36.76	19.64	1.27%	0.72%	21.0°C	2016/6/17
1900MHz Body	39.90	21.00	42.00	21.64	5.26%	3.05%	21.0°C	2016/6/16
1900MHz Body	39.90	21.00	43.20	22.32	8.27%	6.29%	21.0°C	2016/6/29
2450MHz Body	51.90	24.30	49.60	23.32	-4.43%	-4.03%	21.0°C	2016/6/25

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 SMA. It is fed with a power of 250 mW(below 5GHz) or 100mW(above 5GHz). To adjust this power a power meter is used. The power sensor is connected to the cable before the system check to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the system check to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test (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 v01r04, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

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

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

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 v01r04,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).

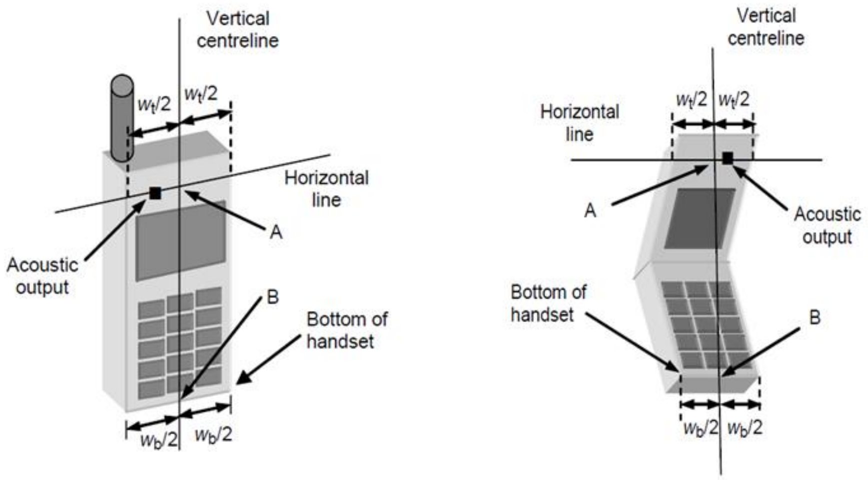


Figure 1 Hand Vertical Center & Horizontal Line Reference Points

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.

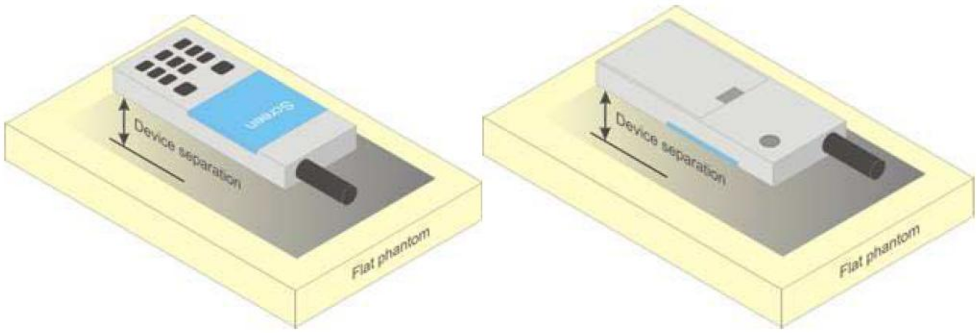


Figure 4 Test position for Body-Worn device

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.

6.1.5 Product specific 10-g Exposure Condition

Per FCC KDB 648474D04, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, the device is marketed as “Phablet”.

The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for product specific 10-g SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions. The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, product specific 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg; however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold.

6.1.6 Proximity sensor Test Configuration

Due to the operating configurations and exposure conditions required by the device, an infrared proximity sensor is used to reduce the output power of Wi-Fi antenna for when Wi-Fi and 2G&3G&4G main antenna voice mode transmit simultaneously in held-to-ear scenario.

In this section, the following procedure is used to determine the triggering distances, coverage and tilt angle influences per FCC KDB 616217 D04 §6.

1) Procedures for determining proximity sensor triggering distances

The procedure per FCC KDB 616217 D04 §6.2 is used to determine the triggering distances. As the proximity sensor locates on the front face of the device and detects objects approaching only from the front side, so triggering distance only need to be checked for the front side when 2G&3G&4G main antenna voice and WiFi simultaneous transmission.

FCC KDB 616217 D04v01§6.2, the proximity sensor triggering distance measurement results are as below:

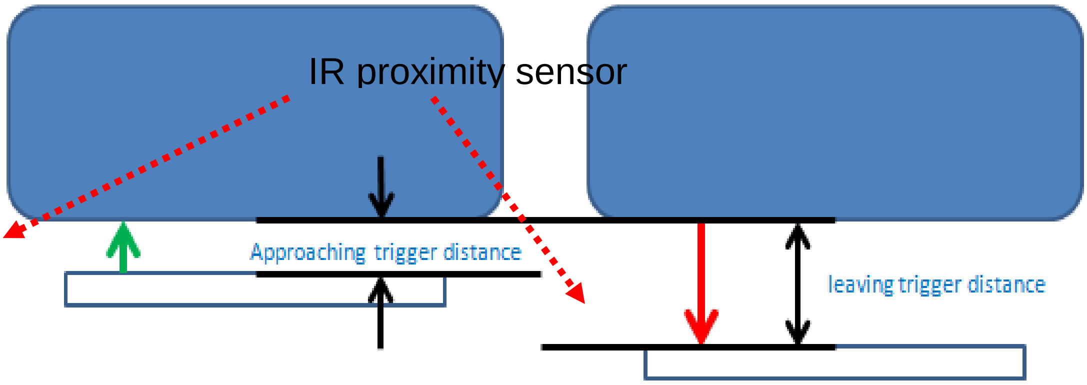
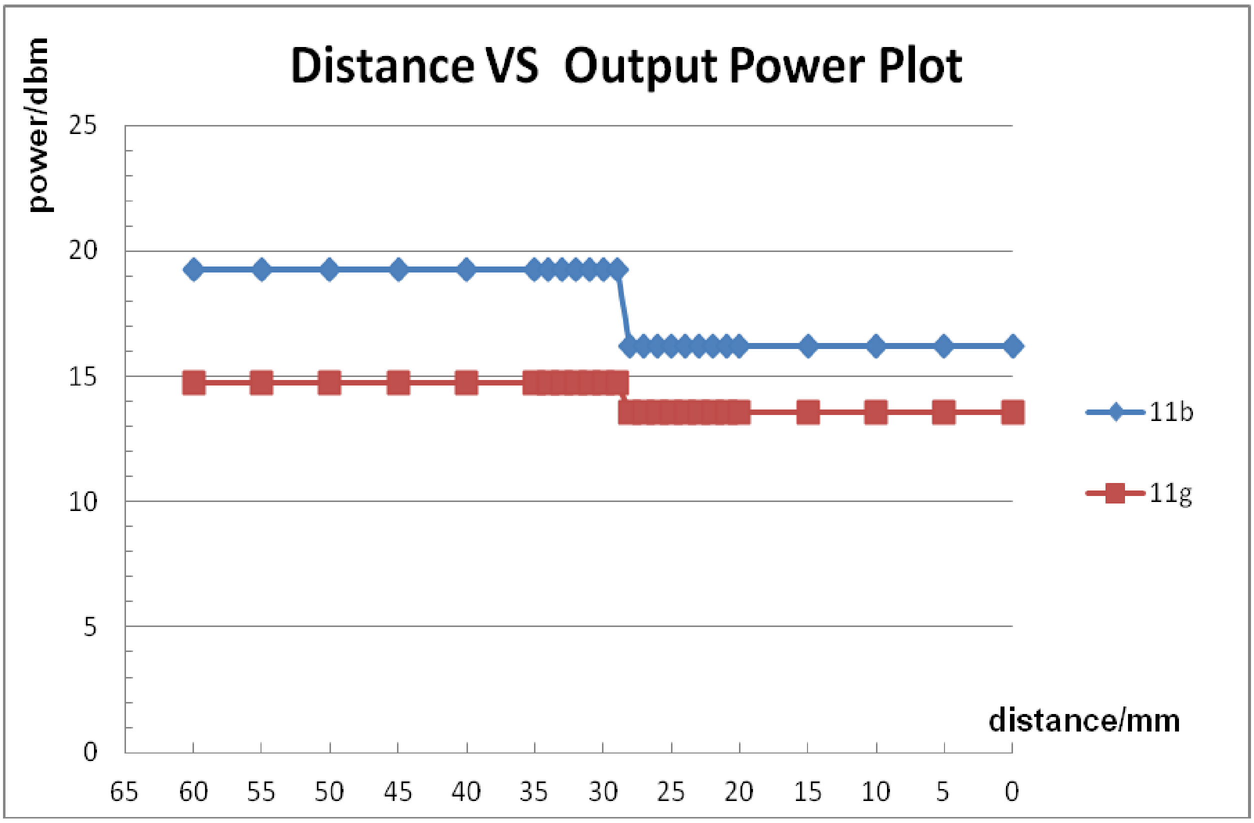
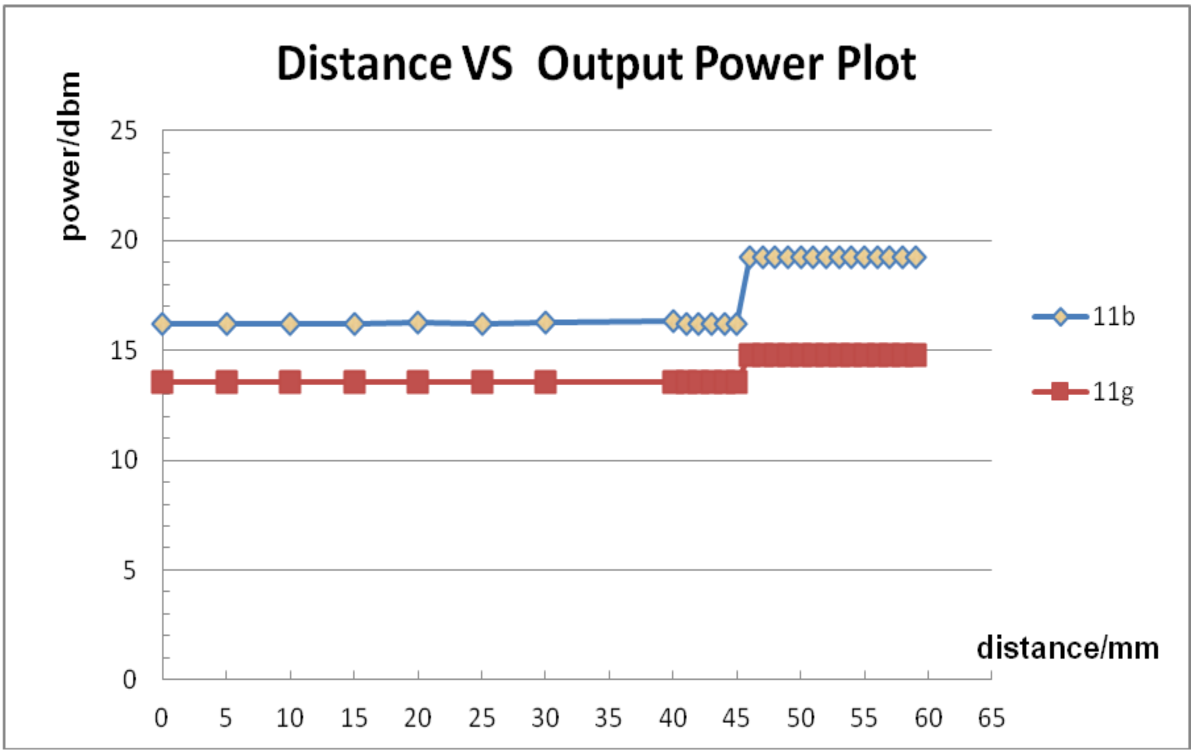


Figure : Proximity sensor triggering distances assessment (Front side only)

The DUT is moved towards from the flat phantom (Wi-Fi 2.4G, when 2G&3G&4G main antenna voice and WiFi simultaneous transmission):



The DUT is moved away from the flat phantom(Wi-Fi 2.4G, when 2G&3G&4G main antenna voice and WiFi simultaneous transmission):



Conclusion: It can be ensured that the proximity sensor can be valid triggered in held-to-ear scenario.

2) Procedures for determining antenna and proximity sensor coverage

The proximity sensor triggering power reduction is only applicable for the front side, not including the edges. For front side view, there is no spatial offset between the WiFi antenna and the proximity sensor element. The scene does not exist when the antenna is next to the user but the sensor is laterally further away, so procedures for determining the proximity sensor coverage per FCC KDB 616217§6.3 does not need to be assessed.

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

The following procedure is used to determine the triggering angle.

For Head exposure condition, device tilt angle influences to proximity sensor triggering is determined as below:

Firstly, the DUT was positioned directly touch the Head SAM phantom (Left&Right hand touch cheek position). Rotate the DUT around the ear reference point of the phantom in 5° increments until the DUT is 15° tilted or more away from the touch cheek position at 0° .

Secondly, the DUT is positioned at 15° or more away from the touch cheek position and moved towards the SAM phantom in 5°increments until the DUT directly touch the SAM phantom at 0°(Left & Right hand touch cheek position).

The DUT is moved towards and away from SAM phantom:

Angle between phantom to DUT in degree	0°	5°	10°	15°	20°	25°	30°
Condition of Sensor power reduction (Wi-Fi + 2G&3G&4G main antenna voice)	on	on	on	on	on	on	on

Conclusion: Based on the validation results above, angle tilt coverage can ensure that the proximity sensor is valid triggered for all required Head test positions(Left/Right Hand Touched cheek and Left/Right Hand tiled 15 °).

4) Summary SAR test Plan for Proximity sensor power reduction scenarios

For Head SAR compliance: Head SAR for Wi-Fi antenna is evaluated at reduced power levels according to the real usage scenarios.

6.2 3G SAR Test Reduction Procedure

Per KDB941225 D01v03, 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 CDMA Test Configuration

6.3.1 1x RTT Handsets

1) Output Power Verification

Maximum output power is verified on the high, middle and low channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. Results for at least steps 3, 4 and 10 of the power measurement procedures are required in the SAR report. Steps 3 and 4 are measured using Loopback Service Option SO55 with power control bits in “All Up” condition. TDSO/SO32 may be used instead of SO55 for step 4. Step 10 is measured using TDSO/SO32 with power control bits in the “Bits Hold” condition (i.e. alternative Up/Down Bits). All power measurements defined in C.S0011/TIA-98-E that are inapplicable to the handset or cannot be measured due to technical or equipment limitations must be clearly identified in the test report.

Test Parameter setup for maximum RF output power according to section 4.4.5 of 3GPP2;

Parameter	Units	Value
I or	dBm/1.23MHz	-104
PilotE c/I or	dB	-7
TrafficE c /I or	dB	-7.4

2) Head SAR

SAR for next to the ear head exposure is measured in RC3 with the handset configured to transmit at full rate in SO55. The 3G SAR test reduction procedure is applied to RC1 with RC3 as the primary mode; otherwise, SAR is required for the channel with maximum measured output in RC1 using the head exposure configuration that results in the highest *reported* SAR in RC3.

3) Body-Worn Accessory SAR

Body-worn accessory SAR is measured in RC3 with the handset configured in TDSO/SO32 to transmit at full rate on FCH only with all other code channels disabled. The body-worn accessory procedures in KDB Publication 447498 are applied. The 3G SAR test reduction procedure is applied to the multiple code channel configuration (FCH+SCHn), with FCH only as the primary mode. Otherwise, SAR is required for multiple code channel configuration (FCH + SCHn), with FCH at full rate and SCH0 enabled at 9600 bps, using the highest *reported* SAR configuration for FCH only. When multiple code channels are enabled, the transmitter output can shift by more than 0.5 dB and may lead to higher SAR drifts and SCH dropouts.

The 3G SAR test reduction procedure is applied to body-worn accessory SAR in RC1 with RC3 as the primary mode.9 Otherwise, SAR is required for RC1, with SO55 and full rate, using the highest *reported* SAR configuration for body-worn accessory exposure in RC3.

Test communication setup meet as followings:

Communication standard between mobile station and base station simulator	3GPP2 C.S0011-B
Radio configuration	RC3(Supporting CDMA 1X)
Spreading Rate	SR1
Data Rate	9600bps
Service Options	SO55(Loopback service)
Service Options	SO32(Test Data service)
Multiplex Options	The mobile station does not support this service

4) Handsets with built-in Ev-Do

For handsets with Ev-Do capabilities, the 3G SAR test reduction procedure is applied to Ev-Do Rev. 0 with 1x RTT RC3 as the primary mode to determine body-worn accessory test requirements. Otherwise, body-worn accessory SAR is required for Rev. 0, at 153.6 kbps, using the highest *reported* SAR configuration for body-worn accessory exposure in RC3.

The 3G SAR test reduction procedure is applied separately to Rev. A and Rev. B, with Rev. 0 as the primary mode to determine body-worn accessory SAR test requirements. When SAR is not required for Rev. 0, the 3G SAR test reduction is applied with 1x RTT RC3 as the primary mode. Otherwise, SAR is required for Rev. A or Rev. B, with a Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 and 3 Physical Layer configurations, using the highest *reported* SAR configuration for body-worn accessory exposure in Rev. 0 or RC3, as appropriate.

A Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with ACK Channel transmitting in all slots is configured in the downlink for Rev. 0, Rev. A and Rev. B.

6.3.2 1x Ev-Do Data Devices

1) Output Power Verification

Maximum output power is verified on the high, middle and low channels according to procedures in section 3.1.2.3.4 of 3GPP2 C.S0033-0/TIA-866 for Rev. 0, section 4.3.4 of 3GPP2 C.S0033-A for Rev. A and section 4.3.4 of 3GPP2 C.S0033-C for Rev. B. Maximum output power is measured for Rev. 0 and Rev. A in Subtype 0/1 and Subtype 2 Physical Layer configurations, respectively. For Rev. B, maximum output power is measured according to power back-off requirements using Subtype 3 Physical Layer with “test 2” and “test 3” configurations. Power is measured using “test 2” with two carries in the maximum frequency separation condition and “test 3” for N-adjacent carriers; where N is the maximum number of carriers supported by the device. Both “test 2” and “test 3” configurations are measured with the channels centered within the transmit frequency band. The device operating configurations under TAP/ETAP/MCTAP must be clearly documented in the test report; including power control, code channel and RF channel output power conditions. The measurement results are required in the SAR report with any measurement difficulties and equipment limitations clearly identified.

2) SAR Measurement

SAR is measured using the F/R TAP configurations required for Rev. 0, Rev. A and Rev. B. The AT is tested with a Reverse Data Channel rate of 153.6 kbps in Subtype 0/1 Physical Layer configurations. A Reverse Data Channel payload size of 4096 bits and Termination Target of 16 slots are used for Subtype 2 and 3. FTAP, FETAP and FMCTAP are all configured with a Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with ACK Channel transmitting in all slots. AT power control is in “All Bits Up” conditions for the TAP/ETAP/MCTAP.

Body-worn accessory and other body SAR are measured using Subtype 0/1 Physical Layer configurations for Rev. 0. The 3G SAR test reduction procedure is applied to Rev. A, Subtype 2 Physical layer configuration, with Rev. 0 as the primary mode; otherwise, SAR is measured for Rev. A using the highest *reported* SAR configuration for body-worn accessory exposure in Rev. 0.

3) 1x RTT Support

For Ev-Do data devices that also support 1x RTT voice and/or data operations, the 3G SAR test reduction procedure is applied to 1x RTT RC3 and RC1 with Ev-Do Rev. 0, Rev. A and Rev. B as the respective primary modes. Otherwise, the ‘Body-Worn Accessory SAR’ procedures in the ‘3GPP2 CDMA 2000 1x Handsets’ section are applied.

4) 1x-Advanced

Maximum output power is verified for 1x-Advanced by applying the 1x RTT power measurement procedures using SO75, with RC8 in the uplink and RC11 in the downlink. Smart blanking must be disabled. The test device is configured with Forward Power Control Mode = 000 and Reverse Power Control = 400 bps; that is, 400 kHz for both uplink and downlink power control. The power measurement results must be included in the SAR report to satisfy power requirements in KDB Publication 447498 and to qualify for SAR test exclusion or to support the SAR test setup and results.

The 3G SAR test reduction procedure is applied to 1x-Advanced with 1x RTT RC3 as the primary mode. When SAR measurement is required, the 1x-Advanced power measurement configurations are used. The 1x Advanced SAR procedures are applied separately to head, body-worn accessory and other exposure conditions.

6.4 LTE Test Configuration

SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05. 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.

6.5 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. The test procedures in KDB 248227D01v02r02 are applied.

6.5.1 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.

6.5.2 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 248227D01v02). 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.

6.5.3 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.

6.5.4 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.

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.

7.1.1 Conducted power measurements of CDMA BC0

CDMA BC0		Average Power (dBm)			
		Tune-up	1013CH	384CH	777CH
RC1	SO55 (Loopback)	25	24.01	24.12	24.01
RC3	SO55 (Loopback)	25	**24.11**	**24.23**	**23.95**
	TDSO/SO32 (FCH+SCH)	25	24.02	24.23	23.94
	TDSO/SO32 (FCH)	25	24.12	**24.23**	23.92
1x Advanced	SO75	25	23.56	23.66	23.38
EVDO Rev 0	FTAP/RTAP	25	23.46	**23.56**	23.28
EVDO Rev A	FETAP/RETAP	25	23.58	23.60	23.40

Table13: Conducted power measurement results of CDMA BC0

Note: 1) The conducted power of CDMA BC0 is measured with RMS detector.

2) Per KDB941225 D01v03, 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.

3) The device does not support EVDO Rev.B or higher function.

7.1.2 Conducted power measurements of CDMA BC1

CDMA BC1		Average Power (dBm)			
		Tune-up	25CH	600CH	1175CH
RC1	SO55 (Loopback)	25	24.28	24.30	24.01
RC3	SO55 (Loopback)	25	**24.30**	**24.31**	**24.02**
	TDSO/SO32 (FCH+SCH)	25	24.28	24.31	24.03
	TDSO/SO32 (FCH)	25	24.32	**24.31**	24.05
1x Advanced	SO75	25	24.10	23.95	23.80
EVDO Rev 0	FTAP/RTAP	25	**24.01**	**23.86**	**23.75**
EVDO Rev A	FETAP/RETAP	25	24.05	23.91	23.83

Table14: Conducted power measurement results of CDMA BC1

Note: 1) The conducted power of CDMA BC1 is measured with RMS detector.

2) Per KDB941225 D01v03, 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.

3) The device does not support EVDO Rev.B or higher function.

7.1.3 Conducted power measurements of LTE Band II

Bandwidth	Modulation	RB size	RB offset	Tune-up	Channel 18607CH	Channel 18900CH	Channel 19193CH
1.4MHz	QPSK	1	0	24.00	23.35	23.18	23.35
		1	3	24.00	23.41	23.21	23.27
		1	5	24.00	23.38	23.12	23.16
		3	0	24.00	23.13	22.96	23.15
		3	2	24.00	23.20	23.03	23.19
		3	3	24.00	23.19	23.03	23.19
		6	0	23.00	22.21	21.99	22.14
	16QAM	1	0	23.00	22.87	22.67	22.57
		1	3	23.00	22.86	22.86	22.86
		1	5	23.00	22.87	22.69	22.76
		3	0	23.00	22.38	22.10	22.43
		3	2	23.00	22.45	21.83	22.38
		3	3	23.00	22.45	21.78	22.50
		6	0	22.00	21.10	20.93	21.40
Bandwidth	Modulation	RB size	RB offset	Tune-up	Channel 18615CH	Channel 18900CH	Channel 19185CH
3MHz	QPSK	1	0	24.00	23.46	23.28	23.23
		1	7	24.00	23.41	23.29	23.33
		1	14	24.00	23.48	23.34	23.33
		8	0	23.00	22.23	22.02	22.11
		8	4	23.00	22.17	22.06	22.14
		8	7	23.00	22.15	22.09	22.13
		15	0	23.00	22.23	22.07	22.16
	16QAM	1	0	23.00	22.34	22.21	22.22
		1	7	23.00	22.48	22.14	22.11
		1	14	23.00	22.55	22.16	22.29
		8	0	22.00	21.14	20.99	21.11
		8	4	22.00	21.39	21.13	21.25
		8	7	22.00	21.25	21.18	21.05
		15	0	22.00	21.19	21.03	21.17

Bandwidth	Modulation	RB size	RB offset	Tune-up	Channel 18625CH	Channel 18900CH	Channel 19175CH
5MHz	QPSK	1	0	24.00	23.10	23.02	23.36
		1	13	24.00	22.82	23.22	23.25
		1	24	24.00	23.25	23.26	23.02
		12	0	23.00	22.19	21.96	22.21
		12	6	23.00	22.18	22.07	22.11
		12	13	23.00	22.17	22.13	22.06
		25	0	23.00	22.14	22.06	22.15
	16QAM	1	0	23.00	21.78	21.72	21.92
		1	13	23.00	21.62	21.71	21.81
		1	24	23.00	21.65	21.89	21.78
		12	0	22.00	20.95	20.74	20.95
		12	6	22.00	20.96	20.75	20.95
		12	13	22.00	20.98	20.81	21.01
		25	0	22.00	21.14	20.97	21.29
Bandwidth	Modulation	RB size	RB offset	Tune-up	Channel 18650CH	Channel 18900CH	Channel 19150CH
10MHz	QPSK	1	0	24.00	23.47	23.30	23.36
		1	25	24.00	23.34	23.27	23.44
		1	49	24.00	23.49	23.41	23.45
		25	0	23.00	22.19	22.04	22.24
		25	13	23.00	22.16	22.16	22.23
		25	25	23.00	22.08	22.15	22.20
		50	0	23.00	22.19	22.10	22.12
	16QAM	1	0	23.00	22.71	22.33	22.31
		1	25	23.00	22.83	22.44	22.89
		1	49	23.00	22.96	22.90	22.83
		25	0	22.00	21.19	20.95	21.27
		25	13	22.00	21.00	20.99	21.12
		25	25	22.00	21.05	21.08	21.07
		50	0	22.00	20.99	20.96	21.13

Bandwidth	Modulation	RB size	RB offset	Tune-up	Channel 18675CH	Channel 18900CH	Channel 19125CH
15MHz	QPSK	1	0	24.00	23.46	23.40	23.24
		1	38	24.00	23.21	23.37	23.13
		1	74	24.00	23.36	23.39	23.20
		36	0	23.00	22.10	22.04	22.07
		36	18	23.00	22.08	22.09	22.16
		36	39	23.00	22.14	22.07	22.12
		75	0	23.00	22.26	22.03	22.09
	16QAM	1	0	23.00	22.80	22.04	22.08
		1	38	23.00	22.55	22.40	21.96
		1	74	23.00	22.59	22.62	22.23
		36	0	22.00	21.00	21.05	21.11
		36	18	22.00	20.92	21.02	21.10
		36	39	22.00	20.97	21.01	21.18
		75	0	22.00	21.09	20.86	21.03
Bandwidth	Modulation	RB size	RB offset	Tune-up	Channel 18700CH	Channel 18900CH	Channel 19100CH
20MHz	QPSK	1	0	24.00	**23.14**	**23.32**	23.05
		1	50	24.00	23.01	22.97	**23.18**
		1	99	24.00	22.74	22.77	22.96
		50	0	23.00	21.93	21.83	**21.96**
		50	25	23.00	21.89	21.79	21.91
		50	50	23.00	21.92	21.84	21.90
		100	0	23.00	21.90	21.87	21.81
	16QAM	1	0	23.00	22.85	22.00	22.16
		1	50	23.00	22.94	22.25	22.27
		1	99	23.00	21.96	21.97	22.11
		50	0	22.00	21.13	21.02	21.19
		50	25	22.00	20.99	21.17	21.19
		50	50	22.00	20.99	20.96	21.12
		100	0	22.00	21.20	21.00	21.10

Table 7: Conducted power measurement results of LTE Band II

7.1.4 Conducted power measurements of LTE Band IV

Bandwidth	Modulation	RB size	RB offset	Tune-up	Channel 19957CH	Channel 20175CH	Channel 20393CH
1.4MHz	QPSK	1	0	24.00	23.02	23.13	23.00
		1	3	24.00	23.03	23.16	23.03
		1	5	24.00	23.00	23.13	22.97
		3	0	24.00	22.88	23.10	23.03
		3	2	24.00	22.93	23.08	23.05
		3	3	24.00	23.00	23.06	23.02
		6	0	23.00	21.93	21.92	22.05
	16QAM	1	0	23.00	22.64	22.47	22.64
		1	3	23.00	22.66	22.68	22.61
		1	5	23.00	22.64	22.69	22.71
		3	0	23.00	22.16	22.22	21.85
		3	2	23.00	22.19	22.27	21.86
		3	3	23.00	22.24	22.19	21.82
		6	0	22.00	21.41	20.86	20.84
Bandwidth	Modulation	RB size	RB offset	Tune-up	Channel 19965CH	Channel 20175CH	Channel 20385CH
3MHz	QPSK	1	0	24.00	23.14	23.12	23.01
		1	7	24.00	23.22	23.18	23.11
		1	14	24.00	23.25	23.21	22.93
		8	0	23.00	21.98	22.03	21.94
		8	4	23.00	21.98	22.06	22.05
		8	7	23.00	21.97	21.94	22.01
		15	0	23.00	22.00	21.94	22.09
	16QAM	1	0	23.00	22.10	22.15	22.20
		1	7	23.00	21.98	22.03	22.05
		1	14	23.00	21.86	22.07	21.92
		8	0	22.00	20.65	20.86	21.13
		8	4	22.00	20.81	21.00	20.97
		8	7	22.00	20.65	20.99	20.94
		15	0	22.00	20.82	21.00	20.94

Bandwidth	Modulation	RB size	RB offset	Tune-up	Channel 19975CH	Channel 20175CH	Channel 20375CH
5MHz	QPSK	1	0	24.00	23.04	23.05	23.10
		1	13	24.00	22.90	22.87	22.93
		1	24	24.00	22.95	23.08	22.97
		12	0	23.00	22.01	21.96	22.01
		12	6	23.00	22.03	21.92	21.98
		12	13	23.00	22.01	21.93	21.95
		25	0	23.00	22.02	22.02	21.95
	16QAM	1	0	23.00	22.02	21.89	21.89
		1	13	23.00	21.91	21.61	21.76
		1	24	23.00	21.71	21.69	21.76
		12	0	22.00	20.93	20.76	21.07
		12	6	22.00	21.13	20.83	21.00
		12	13	22.00	20.95	20.88	21.08
		25	0	22.00	20.99	21.04	21.02
Bandwidth	Modulation	RB size	RB offset	Tune-up	Channel 20000CH	Channel 20175CH	Channel 20350CH
10MHz	QPSK	1	0	24.00	23.03	23.35	23.34
		1	25	24.00	23.26	23.06	23.21
		1	49	24.00	23.37	23.24	23.31
		25	0	23.00	22.14	22.06	22.18
		25	13	23.00	22.06	22.08	22.15
		25	25	23.00	22.11	22.11	22.01
		50	0	23.00	22.12	22.01	22.10
	16QAM	1	0	23.00	22.27	22.32	22.33
		1	25	23.00	22.76	22.75	22.77
		1	49	23.00	22.72	22.69	22.66
		25	0	22.00	21.03	21.05	21.14
		25	13	22.00	21.13	21.11	21.11
		25	25	22.00	21.17	21.14	21.07
		50	0	22.00	20.98	20.89	21.04

Bandwidth	Modulation	RB size	RB offset	Tune-up	Channel 20025CH	Channel 20175CH	Channel 20325CH
15MHz	QPSK	1	0	24.00	23.19	23.33	23.22
		1	38	24.00	23.08	23.01	23.12
		1	74	24.00	23.27	23.09	23.25
		36	0	23.00	22.07	22.10	22.07
		36	18	23.00	22.04	22.03	22.14
		36	39	23.00	22.05	21.95	22.06
		75	0	23.00	22.07	22.05	22.01
	16QAM	1	0	23.00	22.07	22.21	22.03
		1	38	23.00	21.89	21.93	22.07
		1	74	23.00	22.08	22.01	22.02
		36	0	22.00	21.13	20.99	20.98
		36	18	22.00	21.11	20.84	21.06
		36	39	22.00	21.01	20.84	21.09
		75	0	22.00	21.02	20.87	21.02
Bandwidth	Modulation	RB size	RB offset	Tune-up	Channel 20050CH	Channel 20175CH	Channel 20300CH
20MHz	QPSK	1	0	24.00	22.98	23.12	23.11
		1	50	24.00	**23.14**	**23.15**	**23.56**
		1	99	24.00	22.90	23.01	23.17
		50	0	23.00	22.09	**22.18**	22.13
		50	25	23.00	22.03	22.06	22.07
		50	50	23.00	21.99	22.05	22.11
		100	0	23.00	22.05	22.06	**22.07**
	16QAM	1	0	23.00	21.90	22.12	21.90
		1	50	23.00	21.94	21.93	22.32
		1	99	23.00	21.72	21.89	22.27
		50	0	22.00	21.04	21.05	21.00
		50	25	22.00	20.98	20.94	20.98
		50	50	22.00	21.02	20.87	20.99
		100	0	22.00	21.01	20.95	21.03

7.1.5 Conducted power measurements of LTE Band XIII

Bandwidth	Modulation	RB size	RB offset	Tune-up	Channel 23205CH	Channel 23230CH	Channel 23255CH
5MHz	QPSK	1	0	24.00	22.89	23.19	23.17
		1	13	24.00	22.56	22.88	22.97
		1	24	24.00	22.62	23.03	23.04
		12	0	23.00	21.90	21.98	21.95
		12	6	23.00	21.93	21.89	21.87
		12	13	23.00	22.00	21.82	21.88
		25	0	23.00	21.92	21.97	21.94
	16QAM	1	0	23.00	21.87	21.89	21.86
		1	13	23.00	21.64	21.62	21.40
		1	24	23.00	21.49	21.67	21.53
		12	0	22.00	20.93	20.86	20.88
		12	6	22.00	20.96	20.89	20.81
		12	13	22.00	20.75	20.92	20.89
		25	0	22.00	20.94	20.98	20.99
Bandwidth	Modulation	RB size	RB offset	Tune-up	Channel /	Channel 23230CH	Channel /
10MHz	QPSK	1	0	24.00	/	**22.71**	/
		1	25	24.00	/	22.52	/
		1	49	24.00	/	22.65	/
		25	0	23.00	/	**21.81**	/
		25	13	23.00	/	21.76	/
		25	25	23.00	/	21.77	/
		50	0	23.00	/	21.73	/
	16QAM	1	0	23.00	/	22.31	/
		1	25	23.00	/	22.49	/
		1	49	23.00	/	22.45	/
		25	0	22.00	/	20.58	/
		25	13	22.00	/	20.59	/
		25	25	22.00	/	20.78	/
		50	0	22.00	/	20.70	/

Table 8: Conducted power measurement results of LTE Band XIII

7.1.6 Conducted power measurements of WiFi 2.4G

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11b	1	2412	1	19.50	18.76	Yes
	6	2437		19.50	18.63	
	11	2462		19.50	**18.95**	
802.11g	1	2412	6	16.00	Not Required	No
	6	2437		16.00	Not Required	
	11	2462		16.00	Not Required	
802.11n-20M	1	2412	6.5	15.00	Not Required	No
	6	2437		15.00	Not Required	
	11	2462		15.00	Not Required	

Table 9: Conducted power measurement results of WiFi 2.4G(full Power Level).
Note: 1) 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	1	16.50	15.76	Yes
	6	2437		16.50	15.35	
	11	2462		16.50	**15.89**	
802.11g	1	2412	6	15.00	Not Required	No
	6	2437		15.00	Not Required	
	11	2462		15.00	Not Required	
802.11n 20M	1	2412	6.5	15.00	Not Required	No
	6	2437		15.00	Not Required	
	11	2462		15.00	Not Required	

Table 10: Conducted power measurement results of WiFi 2.4G(Sensor on, reduced power level).
Note:
1) The Average conducted power of WiFi is measured with RMS detector.

7.1.7 Conducted power measurements of BT

The output power of BT antenna is as following:

BT 2450	Tune-up	Average Conducted Power (dBm)		
		0CH	39CH	78CH
DH5	9.0	6.35	7.60	6.80
2DH5	9.0	4.12	5.22	4.55
3DH5	9.0	4.03	5.35	4.48

BT 2450	Tune-up	Average Conducted Power (dBm)		
		0CH	19CH	39CH
BT 4.0	2.0	-1.24	1.16	0.50

Table 11: 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 detailed SAR plots).

CDMA Notes:

1) Per KDB941225 D01v03, 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.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) 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.

3) Head SAR for Wi-Fi antenna is evaluated at reduced power levels according to the real usage scenarios.

7.2.1 SAR measurement Result of CDMA BC0

Test Position of Head	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR1-g (W/kg)	SAR Plot
			1-g	10-g					
Left touch	384/836.52	RC3 SO55	0.212	0.161	0.03	24.23	25.00	0.253	/
Left tilt	384/836.52	RC3 SO55	0.148	0.102	0.15	24.23	25.00	0.177	/
Right touch	384/836.52	RC3 SO55	0.267	0.202	0.02	24.23	25.00	0.319	/
Right tilt	384/836.52	RC3 SO55	0.174	0.122	0.16	24.23	25.00	0.208	/
Right touch	1013/824.7	RC3 SO55	0.268	0.201	-0.12	24.11	25.00	0.329	/
Right touch	777/848.31	RC3 SO55	**0.269**	0.201	0.11	23.95	25.00	**0.343**	Yes

Table 12: Head SAR test results of CDMA BC0

Test Position of Body-Worn with 15mm	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR1-g (W/kg)	SAR Plot
			1-g	10-g					
Front Side	384/836.52	RC3 TDSO/ SO32	0.280	0.207	-0.03	24.23	25.00	0.334	/
Back Side	384/836.52	RC3 TDSO/ SO32	**0.301**	0.229	0.09	24.23	25.00	**0.359**	Yes

Table 13: Body-Worn SAR test results of CDMA BC0

Test Position of Hotspot with 10mm	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR1-g (W/kg)	SAR Plot
			1-g	10-g					
Front Side	384/836.52	Rev.0	0.334	0.244	0.05	23.56	25.00	0.465	/
Back Side	384/836.52	Rev.0	**0.447**	0.249	0.02	23.56	25.00	**0.623**	Yes
Left Side	384/836.52	Rev.0	0.244	0.163	-0.01	23.56	25.00	0.340	/
Right Side	384/836.52	Rev.0	0.424	0.287	-0.10	23.56	25.00	0.591	/
Bottom Side	384/836.52	Rev.0	0.321	0.173	-0.11	23.56	25.00	0.447	/

Table 14: Hotspot SAR test results of CDMA BC0

Note: Per KDB 648474 D04, product specific 10-g SAR test is not required for this frequency band since hotspot mode 1-g reported SAR < 1.2 W/kg.

7.2.2 SAR measurement Result of CDMA BC1

Test Position of Head	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR1-g (W/kg)	SAR Plot
			1-g	10-g					
Left touch	600/1880	RC3 SO55	0.436	0.277	0.03	24.31	25.00	0.511	/
Left tilt	600/1880	RC3 SO55	0.217	0.125	0.07	24.31	25.00	0.254	/
Right touch	600/1880	RC3 SO55	0.262	0.156	0.03	24.31	25.00	0.307	/
Right tilt	600/1880	RC3 SO55	0.150	0.081	0.09	24.31	25.00	0.176	/
Left touch	25/1851.25	RC3 SO55	0.428	0.251	0.12	24.30	25.00	0.503	/
Left touch	1175/1908.75	RC3 SO55	**0.432**	0.251	0.18	24.02	25.00	**0.541**	Yes

Table 15: Head SAR test results of CDMA BC1

Test Position of Body-Worn with 15mm	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR1-g (W/kg)	SAR Plot
			1-g	10-g					
Front Side	600/1880	RC3 TDSO/ SO32	0.327	0.191	0.12	24.31	25.00	0.383	/
Back Side	600/1880	RC3 TDSO/ SO32	**0.348**	0.205	-0.02	24.31	25.00	**0.408**	Yes

Table 16: Body-Worn SAR test results of CDMA BC1

Test Position of Hotspot with 10mm	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR1-g (W/kg)	SAR Plot
			1-g	10-g					
Front Side	600/1880	Rev.0	0.756	0.419	0.05	23.86	25.00	0.983	/
Front Side	25/1851.25	Rev.0	0.719	0.404	0.04	24.01	25.00	0.903	/
Front Side	1175/1908.75	Rev.0	0.674	0.383	0.14	23.75	25.00	0.899	/
Back Side	600/1880	Rev.0	**0.853**	0.478	-0.04	23.86	25.00	**1.109**	Yes
Back Side-Repeated	600/1880	Rev.0	0.731	0.417	-0.10	23.86	25.00	0.950	/
Back Side	25/1851.25	Rev.0	0.770	0.448	0.04	24.01	25.00	0.967	/
Back Side	1175/1908.75	Rev.0	0.790	0.443	0.04	23.75	25.00	1.053	/
Left Side	600/1880	Rev.0	0.463	0.258	0.08	23.86	25.00	0.602	/
Right Side	600/1880	Rev.0	0.258	0.146	0.16	23.86	25.00	0.335	/
Bottom Side	600/1880	Rev.0	0.742	0.428	0.04	23.86	25.00	0.965	/
Bottom Side	25/1851.25	Rev.0	0.719	0.420	0.07	24.01	25.00	0.903	/
Bottom Side	1175/1908.75	Rev.0	0.753	0.433	0.05	23.75	25.00	1.004	/

Table 17: Hotspot SAR test results of CDMA BC1

Note: Per KDB 648474 D04, product specific 10-g SAR test is not required for this frequency band since hotspot mode 1-g reported SAR < 1.2 W/kg.

7.2.3 SAR measurement Result of LTE Band II

Test Position of Head	Test channel / Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR_{1-g} (W/kg)	SAR Plot
			1-g	10-g					
1RB									
Left touch	18900/1880	20M QPSK 1RB#0	0.370	0.238	0.13	23.32	24.00	0.433	/
Left tilt	18900/1880	20M QPSK 1RB#0	0.206	0.120	0.06	23.32	24.00	0.241	/
Right touch	18900/1880	20M QPSK 1RB#0	0.278	0.177	0.12	23.32	24.00	0.325	/
Right tilt	18900/1880	20M QPSK 1RB#0	0.177	0.103	0.08	23.32	24.00	0.207	/
Left touch	18700/1860	20M QPSK 1RB#0	**0.377**	0.239	-0.06	23.14	24.00	**0.460**	Yes
Left touch	19100/1900	20M QPSK 1RB#50	0.339	0.212	0.09	23.18	24.00	0.409	/
50%RB									
Left touch	19100/1900	20M QPSK 50%RB#0	0.253	0.149	0.19	21.96	23.00	0.321	/
Left tilt	19100/1900	20M QPSK 50%RB#0	0.144	0.084	0.13	21.96	23.00	0.183	/
Right touch	19100/1900	20M QPSK 50%RB#0	0.176	0.104	0.18	21.96	23.00	0.224	/
Right tilt	19100/1900	20M QPSK 50%RB#0	0.124	0.072	0.11	21.96	23.00	0.158	/

Table 18: Head SAR test results of LTE Band II

Test Position of Body-Worn with 15mm	Test channel / Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR_{1-g} (W/kg)	SAR Plot
			1-g	10-g					
1RB									
Front Side	18900/1880	20M QPSK 1RB#0	0.284	0.188	0.16	23.32	24.00	0.332	/
Back Side	18900/1880	20M QPSK 1RB#0	**0.341**	0.200	0.05	23.32	24.00	**0.399**	Yes
50%RB									
Front Side	19100/1900	20M QPSK 50%RB#0	0.186	0.116	0.01	21.96	23.00	0.236	/
Back Side	19100/1900	20M QPSK 50%RB#0	0.261	0.156	0.03	21.96	23.00	0.332	/

Table 19: Body-Worn SAR test results of LTE Band II

Test Position of Hotspot with 10mm	Test channel / Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR_{1-g} (W/kg)	SAR Plot
			1-g	10-g					
1RB									
Front Side	18900/1880	20M QPSK 1RB#0	0.638	0.359	0.05	23.32	24.00	0.746	/
Back Side	18900/1880	20M QPSK 1RB#0	**0.670**	0.383	0.14	23.32	24.00	**0.784**	Yes
Left Side	18900/1880	20M QPSK 1RB#0	0.463	0.260	-0.01	23.32	24.00	0.541	/
Right Side	18900/1880	20M QPSK 1RB#0	0.230	0.129	0.02	23.32	24.00	0.269	/
Bottom Side	18900/1880	20M QPSK 1RB#0	0.663	0.383	0.18	23.32	24.00	0.775	/
50%RB									
Front Side	19100/1900	20M QPSK 50%RB#0	0.504	0.283	0.03	21.96	23.00	0.640	/
Back Side	19100/1900	20M QPSK 50%RB#0	0.508	0.294	0.05	21.96	23.00	0.645	/
Left Side	19100/1900	20M QPSK 50%RB#0	0.358	0.201	-0.03	21.96	23.00	0.455	/
Right Side	19100/1900	20M QPSK 50%RB#0	0.179	0.099	0.13	21.96	23.00	0.227	/
Bottom Side	19100/1900	20M QPSK 50%RB#0	0.534	0.300	-0.10	21.96	23.00	0.678	/

Table 20: Hotspot SAR test results of LTE Band II

Note: Per KDB 648474 D04, product specific 10-g SAR test is not required for this frequency band since hotspot mode 1-g reported SAR < 1.2 W/kg.

7.2.4 SAR measurement Result of LTE Band IV

Test Position of Head	Test channel / Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR_{1-g} (W/kg)	SAR Plot
			1-g	10-g					
1RB									
Left touch	20300/1745	20M QPSK 1RB#50	**0.345**	0.228	0.09	23.56	24.00	**0.382**	Yes
Left tilt	20300/1745	20M QPSK 1RB#50	0.164	0.097	0.08	23.56	24.00	0.181	/
Right touch	20300/1745	20M QPSK 1RB#50	0.295	0.192	0.08	23.56	24.00	0.326	/
Right tilt	20300/1745	20M QPSK 1RB#50	0.144	0.085	0.08	23.56	24.00	0.159	/
Left touch	20050/1720	20M QPSK 1RB#50	0.256	0.157	0.16	23.14	24.00	0.312	/
Left touch	20175/1732.5	20M QPSK 1RB#50	0.312	0.209	0.12	23.15	24.00	0.379	/
50%RB									
Left touch	20175/1732.5	20M QPSK 50%RB#0	0.234	0.142	0.17	22.18	23.00	0.283	/
Left tilt	20175/1732.5	20M QPSK 50%RB#0	0.123	0.073	0.14	22.18	23.00	0.149	/
Right touch	20175/1732.5	20M QPSK 50%RB#0	0.195	0.118	0.11	22.18	23.00	0.236	/
Right tilt	20175/1732.5	20M QPSK 50%RB#0	0.110	0.065	0.08	22.18	23.00	0.133	/

Table 21: Head SAR test results of LTE Band IV

Test Position of Body-Worn with 15mm	Test channel / Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR_{1-g} (W/kg)	SAR Plot
			1-g	10-g					
1RB									
Front Side	20300/1745	20M QPSK 1RB#50	0.331	0.221	0.14	23.56	24.00	0.366	/
Back Side	20300/1745	20M QPSK 1RB#50	**0.400**	0.265	0.04	23.56	24.00	**0.443**	Yes
50%RB									
Front Side	20175/1732.5	20M QPSK 50%RB#0	0.251	0.157	0.09	22.18	23.00	0.303	/
Back Side	20175/1732.5	20M QPSK 50%RB#0	0.255	0.161	0.06	22.18	23.00	0.308	/

Table 22: Body-Worn SAR test results of LTE Band IV

Test Position of Hotspot with 10mm	Test channel / Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR_{1-g} (W/kg)	SAR Plot
			1-g	10-g					
1RB									
Front Side	20300/1745	20M QPSK 1RB#50	0.548	0.360	0.10	23.56	24.00	0.606	/
Back Side	20300/1745	20M QPSK 1RB#50	**0.747**	0.485	-0.07	23.56	24.00	0.827	Yes
Back Side	20050/1720	20M QPSK 1RB#50	0.729	0.473	-0.02	23.56	24.00	0.807	/
Back Side	20175/1732.5	20M QPSK 1RB#50	0.704	0.456	0.12	23.56	24.00	0.779	/
Left Side	20300/1745	20M QPSK 1RB#50	0.411	0.229	-0.01	23.56	24.00	0.455	/
Right Side	20300/1745	20M QPSK 1RB#50	0.168	0.099	0.11	23.56	24.00	0.186	/
Bottom Side	20300/1745	20M QPSK 1RB#50	0.695	0.412	-0.04	23.56	24.00	0.769	/
Front Side	20300/1745	20M QPSK 1RB#50	0.548	0.360	0.10	23.56	24.00	0.606	/
50%RB									
Front Side	20175/1732.5	20M QPSK 50%RB#0	0.411	0.254	0.10	22.18	23.00	0.496	/
Back Side	20175/1732.5	20M QPSK 50%RB#0	0.563	0.348	0.07	22.18	23.00	0.680	/
Left Side	20175/1732.5	20M QPSK 50%RB#0	0.288	0.161	-0.01	22.18	23.00	0.348	/
Right Side	20175/1732.5	20M QPSK 50%RB#0	0.120	0.069	0.04	22.18	23.00	0.145	/
Bottom Side	20175/1732.5	20M QPSK 50%RB#0	0.516	0.306	-0.09	22.18	23.00	0.623	/
100%RB									
Back Side	20300/1745	20M QPSK 100%RB#0	0.581	0.377	-0.08	22.07	23.00	0.720	/

Table 23: Hotspot SAR test results of LTE Band IV

Note: Per KDB 648474 D04, product specific 10-g SAR test is not required for this frequency band since hotspot mode 1-g reported SAR < 1.2 W/kg.

7.2.5 SAR measurement Result of LTE Band XIII

Test Position of Head	Test channel / Freq.(MHz)	Test Mode	SAR Value (W/kg) 1-g	SAR Value (W/kg) 10-g	Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR_{1-g} (W/kg)	SAR Plot
1RB									
Left touch	23230/782	10M QPSK 1RB#0	0.178	0.137	0.13	22.71	24.00	0.240	/
Left tilt	23230/782	10M QPSK 1RB#0	0.120	0.084	0.08	22.71	24.00	0.162	/
Right touch	23230/782	10M QPSK 1RB#0	**0.211**	0.161	0.10	22.71	24.00	**0.284**	Yes
Right tilt	23230/782	10M QPSK 1RB#0	0.120	0.085	0.12	22.71	24.00	0.162	/
50%RB									
Left touch	23230/782	10M QPSK 50%RB#0	0.130	0.090	0.18	21.81	23.00	0.171	/
Left tilt	23230/782	10M QPSK 50%RB#0	0.097	0.068	0.12	21.81	23.00	0.128	/
Right touch	23230/782	10M QPSK 50%RB#0	0.152	0.105	0.13	21.81	23.00	0.200	/
Right tilt	23230/782	10M QPSK 50%RB#0	0.099	0.070	0.03	21.81	23.00	0.130	/

Table 24: Head SAR test results of LTE Band XIII

Test Position of Body-Worn with 15mm	Test channel / Freq.(MHz)	Test Mode	SAR Value (W/kg) 1-g	SAR Value (W/kg) 10-g	Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR_{1-g} (W/kg)	SAR Plot
1RB									
Front Side	23230/782	10M QPSK 1RB#0	0.237	0.183	-0.14	22.71	24.00	0.319	/
Back Side	23230/782	10M QPSK 1RB#0	**0.273**	0.208	0.07	22.71	24.00	**0.367**	Yes
50%RB									
Front Side	23230/782	10M QPSK 50%RB#0	0.192	0.137	-0.12	21.81	23.00	0.253	/
Back Side	23230/782	10M QPSK 50%RB#0	0.220	0.157	-0.06	21.81	23.00	0.289	/

Table 25: Body-Worn SAR test results of LTE Band XIII

Test Position of Hotspot with 10mm	Test channel / Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR_{1-g} (W/kg)	SAR Plot
			1-g	10-g					
1RB									
Front Side	23230/782	10M QPSK 1RB#0	0.239	0.172	-0.01	22.71	24.00	0.322	/
Back Side	23230/782	10M QPSK 1RB#0	0.281	0.165	0.11	22.71	24.00	0.378	/
Left Side	23230/782	10M QPSK 1RB#0	0.213	0.144	0.12	22.71	24.00	0.287	/
Right Side	23230/782	10M QPSK 1RB#0	**0.347**	0.236	-0.01	22.71	24.00	**0.467**	Yes
Bottom Side	23230/782	10M QPSK 1RB#0	0.233	0.128	0.11	22.71	24.00	0.314	/
50%RB									
Front Side	23230/782	10M QPSK 50%RB#0	0.195	0.140	0.01	21.81	23.00	0.256	/
Back Side	23230/782	10M QPSK 50%RB#0	0.259	0.167	-0.06	21.81	23.00	0.341	/
Left Side	23230/782	10M QPSK 50%RB#0	0.187	0.124	-0.06	21.81	23.00	0.246	/
Right Side	23230/782	10M QPSK 50%RB#0	0.308	0.206	0.02	21.81	23.00	0.405	/
Bottom Side	23230/782	10M QPSK 50%RB#0	0.186	0.102	0.00	21.81	23.00	0.245	/

Table 26: Hotspot SAR test results of LTE Band XIII

Note: Per KDB 648474 D04, product specific 10-g SAR test is not required for this frequency band since hotspot mode 1-g reported SAR < 1.2 W/kg.

7.2.6 SAR measurement Result of WiFi 2.4G

Test Position of Head	Test channel / Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR_{1-g} (W/kg)	SAR Plot
			1-g Area Scan	1-g Zoom Scan					
Left touch	11/2462	802.11 b	0.313	0.314	-0.060	15.89	16.50	0.361	/
Left tilt	11/2462	802.11 b	0.202	0.228	0.180	15.89	16.50	0.262	/
Right touch	11/2462	802.11 b	0.142	/	0.110	15.89	16.50	/	/
Right tilt	11/2462	802.11 b	0.121	/	0.190	15.89	16.50	/	/
Left touch	1/2412	802.11 b	0.705	**0.723**	-0.120	15.76	16.50	0.857	Yes
Left touch	6/2437	802.11 b	0.293	0.132	0.000	15.35	16.50	0.172	/

Table 27: Head SAR test results of WiFi 2450MHz

According to KDB248227 D01,The reported SAR must be scaled to 100% transmission duty factor to determine compliance at maximum tune-up tolerance limit.The reported SAR is presented as below.

Test Position of Head	Test channel / Freq.(MHz)	Test Mode	Scaled SAR_{1-g} (W/kg)	Actual duty factor	Maximum duty factor	Reported SAR_{1-g} (W/kg)
Left touch	11/2462	802.11 b	0.361	98.0%	100%	0.369
Left tilt	11/2462	802.11 b	0.262	98.0%	100%	0.268
Right touch	11/2462	802.11 b	/	98.0%	100%	/
Right tilt	11/2462	802.11 b	/	98.0%	100%	/
Left touch	1/2412	802.11 b	0.857	98.0%	100%	**0.875**
Left touch	6/2437	802.11 b	0.172	98.0%	100%	0.176

Mode	Tune-up（dBm）	Tune-up（mW）	Hightest Reported SAR(W/kg)	Adjusted SAR (W/kg)	SAR test
802.11b	16.50	44.67	0.875	/	Yes
802.11g	15.00	31.62	/	0.619	No
802.11n 20M	15.00	31.62	/	0.619	No

Note:

1) 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. As 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 with 15mm	Test channel / Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR_{1-g} (W/kg)	SAR Plot
			1-g Area Scan	1-g Zoom Scan					
Front Side	11/2462	802.11 b	0.052	**0.055**	0.100	18.95	19.50	0.062	Yes
Back Side	11/2462	802.11 b	0.057	0.032	0.120	18.95	19.50	0.036	/

Table 28: Body-Worn SAR test results of WiFi 2450MHz

According to KDB248227 D01,The reported SAR must be scaled to 100% transmission duty factor to determine compliance at maximum tune-up tolerance limit.The reported SAR is presented as below.

Test Position of Body-Worn with 15mm	Test channel / Freq.(MHz)	Test Mode	Scaled SAR_{1-g} (W/kg)	Actual duty factor	Maximum duty factor	Reported SAR_{1-g} (W/kg)
Front Side	11/2462	802.11 b	0.062	98.0%	100%	**0.064**
Back Side	11/2462	802.11 b	0.036	98.0%	100%	0.037

Mode	Tune-up（dBm）	Tune-up（mW）	Hightest Reported SAR(W/kg)	Adjusted SAR (W/kg)	SAR test
802.11b	19.50	89.13	0.064	/	Yes
802.11g	16.00	39.81	/	0.029	No
802.11n 20M	15.00	31.62	/	0.023	No

Note: Per KDB248227D01, for Body-Worn SAR test of WiFi 2.4G, SAR is measured for 2.4 GHz 802.11b DSSS using the initial test position procedure. As 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 with 10mm	Test channel / Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR_{1-g} (W/kg)	SAR Plot
			1-g Area Scan	1-g Zoom Scan					
Front Side	11/2462	802.11 b	0.093	/	0.120	18.95	19.50	/	/
Back Side	11/2462	802.11 b	0.105	0.107	0.150	18.95	19.50	0.121	/
Left Side	11/2462	802.11 b	0.015	/	0.150	18.95	19.50	/	
Right Side	11/2462	802.11 b	0.040	/	0.100	18.95	19.50	/	/
Top Side	11/2462	802.11 b	0.280	**0.283**	0.130	18.95	19.50	0.321	Yes

Table 29: Hotspot SAR test results of WiFi 2450MHz

According to KDB248227 D01,The reported SAR must be scaled to 100% transmission duty factor to determine compliance at maximum tune-up tolerance limit.The scaled reported SAR is presented as below.

Test Position of Hotspot with 10mm	Test channel / Freq.(MHz)	Test Mode	Scaled SAR_{1-g} (W/kg)	Actual duty factor	Maximum duty factor	Scaled Reported SAR_{1-g} (W/kg)
Front Side	11/2462	802.11 b	/	98.0%	100%	/
Back Side	11/2462	802.11 b	0.121	98.0%	100%	0.124
Left Side	11/2462	802.11 b	/	98.0%	100%	/
Right Side	11/2462	802.11 b	/	98.0%		/
Top Side	11/2462	802.11 b	0.321	98.0%	100%	**0.328**

Mode	Tune-up（dBm）	Tune-up（mW）	Hightest Reported SAR(W/kg)	Adjusted SAR (W/kg)	SAR test
802.11b	19.50	89.13	0.328	/	Yes
802.11g	16.00	39.81	/	0.147	No
802.11n 20M	15.00	31.62	/	0.116	No

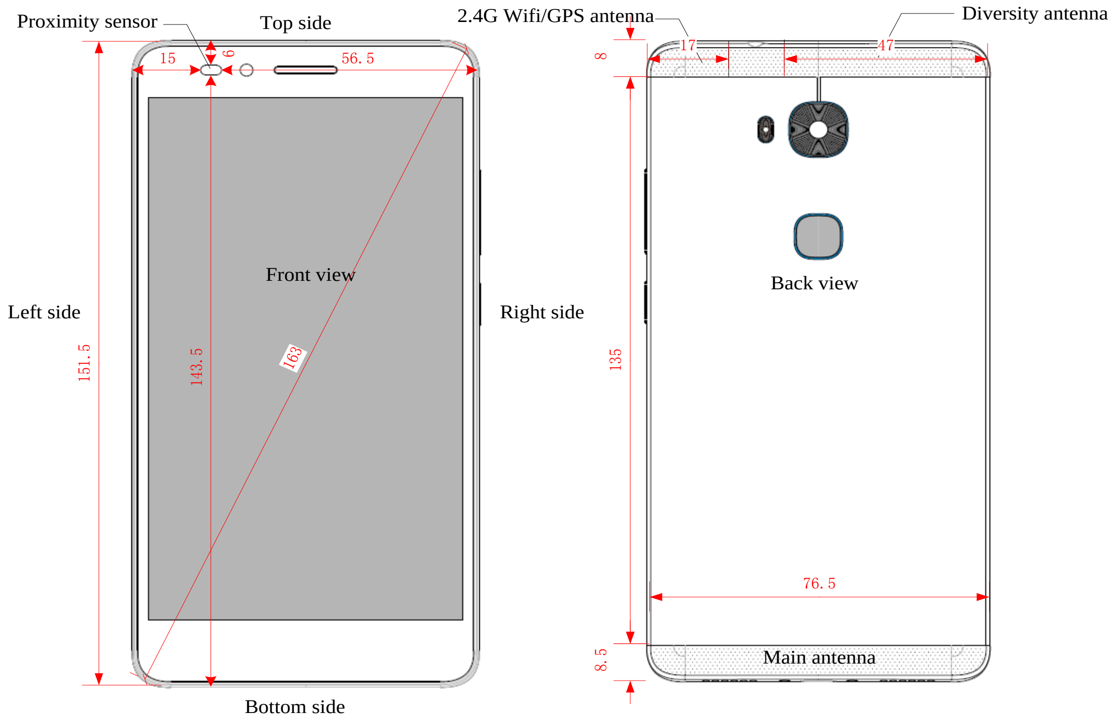
Note :

1) Per KDB248227D01, for Hotspot SAR test of WiFi 2.4G, SAR is measured for 2.4 GHz 802.11b DSSS using the initial test position procedure. As 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.

2) Per KDB 648474 D04, product specific 10-g SAR test is not required for this frequency band since hotspot mode 1-g reported SAR < 1.2 W/kg.

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 v06.
The location of the antennas inside the device is shown as below picture:



Per KDB 648474 D04, because the diagonal distance of this device is about 163mm > 160mm, it is considered a “Phablet” device.

Mode	Exposure Condition	Front Side	Back Side	Left Side	Right Side	Top Side	Bottom Side
Main antenna	Hotspot/ product specific 10-g SAR	Yes	Yes	Yes	Yes	No	Yes
WiFi 2.4G antenna	Hotspot/ product specific 10-g SAR	Yes	Yes	No	Yes	Yes	No

Table 30: Sides for Hotspot SAR testing

Note:
1)The Diversity antenna does not support Tx function.
2) Per KDB 941225 D06 and KDB 648474 D04, particular DUT edges were not required to be evaluated for Hotspot and/or Extremity SAR if the antenna-to-edge distance is greater than 2.5cm.
3) Per KDB 648474 D04, when hotspot mode applies, product specific 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg;

7.3.1 Stand-alone SAR test exclusion

Per FCC KDB 447498D01v06

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

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

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

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

Mode	Position	P_{max} (dBm)*	P_{max} (mW)	Distance (mm)	f (GHz)	Calculation Result	SAR Exclusion threshold	SAR test exclusion
BT	Body-Worn	9.00	7.94	15	2.450	0.83	3.00	Yes
BT	product specific 10-g SAR	9.00	7.94	5	2.450	2.49	7.50	Yes

Table 31: Standalone SAR test exclusion for BT

Note:

1)* - maximum possible output power declared by manufacturer

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

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

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

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

Mode	Position	P_{max} (dBm)*	P_{max} (mW)	Distance (mm)	f (GHz)	X	Estimated SAR (W/kg)*
BT	Body-worn	9.00	7.94	15	2.450	7.50	0.111
BT	product specific 10-g SAR	9.00	7.94	5	2.450	18.75	0.133

Table 32: Estimated SAR calculation for BT

Note:

1) * - maximum possible output power declared by manufacturer

2) Held to ear configurations are not applicable to Bluetooth and therefore were not considered for simultaneous transmission.

7.3.2 Simultaneous Transmission Possibilities

The Simultaneous Transmission Possibilities of this device are as below:

No.	Configuration	Head	Body-worn	Hotspot	Product specific 10-g SAR
1	CDMA(Voice) + BT	No	Yes	No	Yes
2	CDMA/EVDO(Data) + BT	No	Yes	No	Yes
3	CDMA(Voice)+ WiFi 2.4G	Yes	Yes	No	Yes
4	CDMA/EVDO (Data) + WiFi 2.4G	No	Yes	Yes	Yes
5	LTE* + BT	No	Yes	No	Yes
6	LTE* + WiFi 2.4G	Yes	Yes	Yes	Yes

Table 33: Simultaneous Transmission Possibilities

Note:

1) WiFi 2.4G and BT can't transmit simultaneously.

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

3) The device does not support WiFi VoIP function.

4) The device does not support SVLTE function.

5) * The device does not support VoLTE function. VOIP 3rd party applications may possibly be installed and used by the user.

7.3.3 SAR Summation Scenario

Test Position		Main antenna					WiFi/BT antenna SARMax		Σ1-g or product specific 10-g SAR (0mm)
		CDMA BC0	CDMA BC1	LTE Band II	LTE Band IV	LTE Band XIII	WiFi 2.4G	BT	
Head	Left touch	0.253	0.541	0.460	0.382	0.240	0.875	/	1.416
	Left tilt	0.177	0.254	0.241	0.181	0.162	0.268	/	0.522
	Right touch	0.343	0.307	0.325	0.326	0.284	0.875	/	1.218
	Right tilt	0.208	0.176	0.207	0.159	0.162	0.875	/	1.083
Body-worn 15mm	Front side	0.334	0.383	0.332	0.366	0.319	0.064	0.111	0.494
	Back side	0.359	0.408	0.399	0.443	0.369	0.037	0.111	0.554
Hotspot 10mm	Front side	0.465	0.983	0.784	0.606	0.322	0.328		1.311
	Back side	0.623	1.109	0.784	0.827	0.378	0.124	/	1.233
	Left side	0.340	0.602	0.541	0.455	0.287	0.328	/	0.930
	Right side	0.591	0.335	0.269	0.186	0.467	0.328	/	0.919
	Top side	/	/	/	/	/	0.328	/	0.328
	Bottom side	0.447	1.004	0.775	0.769	0.314	/	/	1.004
product specific 10-g SAR (0mm)	Front side	/	/	/	/	/	/	0.133	0.133
	Back side	/	/	/	/	/	/	0.133	0.133
	Left side	/	/	/	/	/	/	0.133	0.133
	Right side	/	/	/	/	/	/	0.133	0.133
	Top side	/	/	/	/	/	/	0.133	0.133
	Bottom side	/	/	/	/	/	/	/	0.000

Table 34: SAR Simultaneous Tx Combination of Main antenna and WiFi/BT.

7.3.4 Simultaneous Transmission Conlcusion

The above numeral summed SAR results and/or 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 D01v06.

Appendix A. System Check Plots

(Pls See Appendix No.: SYBH(Z-SAR)0080062016-2A, total: 13 pages)

Appendix B. SAR Measurement Plots

(Pls See Appendix No.: SYBH(Z-SAR)0080062016-2B, total: 19 pages)

Appendix C. Calibration Certificate

(Pls See Appendix No.: SYBH(Z-SAR)0080062016-2C, total: 58 pages)

Appendix D. Photo documentation

(Pls See Appendix No.: SYBH(Z-SAR)0080062016-2D, total: 6 pages)

End