中国认可
国际互认
检测
TESTING
CNAS L0310

ACCREDITED
TESTING CERT #2174.01

FCC SAR Compliance Test Report

Product Name: HUAWEI MediaPad T3 7.0(MediaPad T3 7)

Model: BG2-W09

Report No.: SYBH(Z-SAR)003022017-2

FCC ID: QISBG2-W09

	APPROVED (Lab Manager)	PREPARED (Test Engineer)
BY	Wei Huanbin	He Peng
DATE	2017-03-15	2017-03-15

Reliability Laboratory of Huawei Technologies Co., Ltd.

(Global Compliance and Testing Center of Huawei Technologies Co., Ltd)

Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
Tel: +86 755 28780808 Fax: +86 755 89652518

※ ※ Notice ※ ※

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

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

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

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

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

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

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

HUAWEI

Table of Contents

※ ※ Modified History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	2017-03-15	He Peng

1 General Information

1.1 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for BG2-W09 is as below Table 1.

Band	**Max Reported 1-g SAR (W/kg)**
	Body(0mm)
WiFi 2.4G	**1.47**
WiFi 5G	1.19
BT	**/**
The highest reported SAR is 1.47W/kg per KDB690783 D01.	

Table 1:Summary of test result

Note: BT SAR test is not required per KDB447498D01.

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

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:	HUAWEI MediaPad T3 7.0(MediaPad T3 7)		
Model:	BG2-W09		
FCC ID :	QISBG2-W09		
SN:	1#:52RBBCB6C3100338 2#:52RBBCB6C3100495		
Device Type :	Portable device		
Device Phase:	Identical Prototype		
Exposure Category:	Uncontrolled environment / general population		
Hardware Version :	SH1BG2W09LM		
Software Version :	BG2-W09C128B001T01-log		
Antenna Type :	Internal antenna		
Device Operating Configurations:			
Supporting Mode(s)	WiFi 2.4G,WiFi 5G, BT		
Test Modulation	WiFi(DSSS/OFDM),BT(GFSK/π/4-DQPSK/8DPSK)		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	BT	2400-2483.5	
	WiFi 2.4G	2400-2483.5	
	WiFi 5G	5150-5350 5470-5725 5725-5850	
Test Channels (low-mid-high):	802.11b/g/n 20M:1-6-11 (WiFi 2.4G) 802.11a/n 20M: 36-40-44-48-52-56-60-64-100-104-108-112-116-120-124-128-132-136-140-144-149-153-157-161-165 802.11 n 40M: 38-46-54-62-102-110-118-126-134-142-151-159 (WiFi 5G)		

Table 3:Device information and operating configuration

1.3.1 General Description

HUAWEI MediaPad T3 7 (MediaPad T3 7) is an 7-inch tablet that incorporates a high-performance quad-core processor (MT8127) and supports 2.4G&5G Wi-Fi data connections.

Battery information:

Name	Manufacture	Serials number	Description
Li-ion	Huawei Technologies Co.,Ltd.	/	Battery Model: HB396481EBC Rated capacity: 3000 mAh Nominal Voltage: ⎓ +3.8V Charging Voltage: ⎓ +4.35V

1.3.2 Power reduction specification

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

Due to the operating configurations and exposure conditions required by the device, the proximity sensor is used to indicate when the device is held close to a user's body exposure condition. It utilizes the proximity sensor to reduce the output power in specific wireless and operating modes of main antenna to ensure SAR compliance. The test procedures in KDB 616217 is applied to determine proximity sensor triggering distances, and sensor coverage for normal and tilt positions. The detailed test configuration description are provided in Section 6 of this report.

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.

Band	WiFi antenna Power Reduction Amount (dB)	
	Sensor on	Sensor off
WiFi 2.4G 802.11b	6	0
WiFi 2.4G 802.11g	5	0
WiFi 2.4G 802.11n(20M)	5	0
WiFi 5G 802.11a	5	0
WiFi 5G 802.11n (20M)	5	0
WiFi 5G 802.11n (40M)	3	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
KDB447498 D01	General RF Exposure Guidance v06
KDB616217 D04	SAR for laptop and tablets v01r02
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

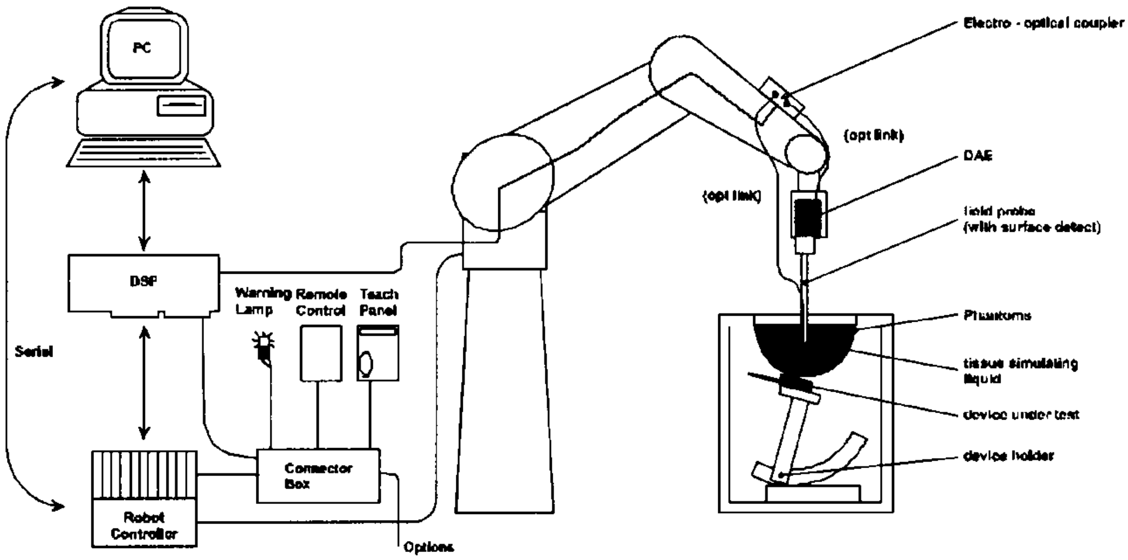
Start Date of test	2017-02-19
End Date of test	2017-02-27

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

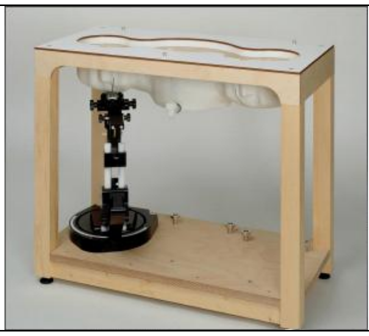

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	10 MHz to 4 GHz; Linearity: ± 0.2 dB (30 MHz to 4 GHz)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

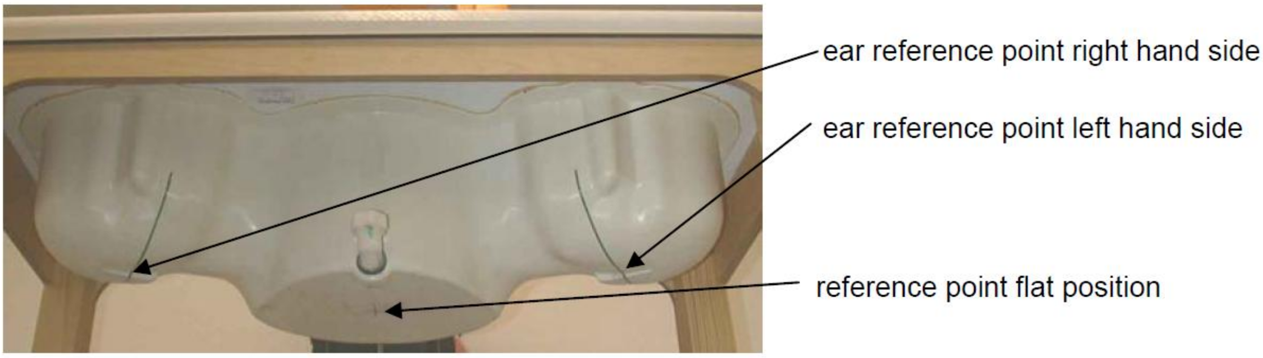

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	10 MHz to >6 GHz; Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 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

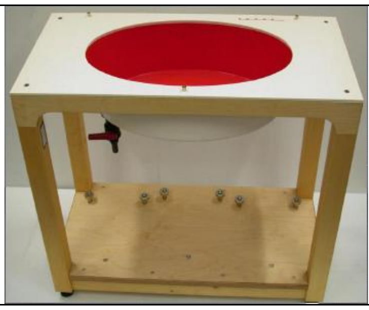
SAM Twin Phantom

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 $2 \le \varepsilon r \le 5$ at ≤3 GHz,$3 \le \varepsilon r \le 4$ at >3 GHz and and a loss tangent ≤0.05.

2.6 Device holder description

The 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	ES3DV3	3168	2016-09-27	One year
☒	SPEAG	Dosimetric E-Field Probe	EX3DV4	3736	2016-04-26	One year
☒	SPEAG	2450MHz Dipole	D2450V2	860	2016-11-23	Three years
☒	SPEAG	5GHz Dipole	D5GHzV2	1155	2016-04-26	Three years
☒	SPEAG	Data acquisition electronics	DAE4	852	2016-04-20	One year
☒	SPEAG	Software	DASY 5	N/A	NCR	NCR
☐	SPEAG	Twin Phantom	SAM1	TP-1475	NCR	NCR
☒	SPEAG	Twin Phantom	SAM2	TP-1474	NCR	NCR
☐	SPEAG	Twin Phantom	SAM3	TP-1597	NCR	NCR
☐	SPEAG	Twin Phantom	SAM4	TP-1620	NCR	NCR
☐	SPEAG	Flat Phantom	ELI 4.0	TP-1038	NCR	NCR
☐	SPEAG	Flat Phantom	ELI 5.0	TP-1111	NCR	NCR
☒	Agilent	Wireless Connectivity Test Set	N4010A	MY49081592	2016-08-05	One year
☒	R&S	Signal Analyser	FSV30	101195	2016-08-31	One year
☒	Agilent	Network Analyser	E5071C	MY46213349	2016-12-30	One year
☒	Agilent	Dielectric Probe Kit	85070E	2484	NCR	NCR
☒	Agilent	Signal Generator	E8257D	MY49281095	2016-08-05	One year
☒	MINI-CIRCUITS	Amplifier	ZHL-42W	QA1402001	NCR	NCR
☒	MINI-CIRCUITS	Amplifier	ZVE-8G+	N523101139	NCR	NCR
☒	AR	Directional Coupler	DC7144M1	31190	2016-05-13	One year
☒	Agilent	Dual Directional Coupler	772D	MY52180173	2017-01-03	One year
☒	R&S	Power Meter	NRP	100740	2016-07-07	One year
☒	R&S	Power Meter Sensor	NRP-Z11	106288	2016-07-20	One year
☒	Agilent	Power Meter	E4417A	MY45101339	2016-12-30	One year
☒	Agilent	Power Meter Sensor	E9321A	MY44420359	2016-12-30	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}, Δy_{zoom}≤ 2GHz - ≤8mm, 2-4GHz - ≤5 mm and 4-6 GHz-≤4mm; Δz_{zoom} ≤3GHz - ≤5 mm, 3-4 GHz- ≤4mm and 4-6GHz-≤2mm where the robot additionally moves the probe along the z-axis away from the bottom of the Phantom. DASY is also able to perform repeated zoom scans if more than 1 peak is found during area scan. In this document, the evaluated peak 1g and 10g averaged SAR values are shown in the 2D-graphics in Appendix B. Test results relevant for the specified standard (see chapter 1.4.)are shown in table form form in chapter 7.2.

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

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

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

3.2 Spatial Peak SAR Evaluation

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

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

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

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

Extrapolation

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

Interpolation

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

Volume Averaging

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

Advanced Extrapolation

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 (HBBL600-6000MHz), Manufactured by SPEAG:**

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

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

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

Tissue Type	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		
Body	2410	52.80	1.91	52.37	1.99	-0.81%	4.29%	21.4°C	2017/02/19
	2435	52.70	1.94	52.35	2.02	-0.66%	3.92%		
	2450	52.70	1.95	52.27	2.03	-0.82%	4.10%		
	2460	52.70	1.96	52.28	2.03	-0.80%	3.72%		
Body	5250	48.90	5.36	48.52	5.39	-0.78%	0.58%	21.7°C	2017/02/27
	5600	48.50	5.77	48.10	5.79	-0.82%	0.26%		
	5750	48.30	5.94	47.53	6.07	-1.59%	2.12%		

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).

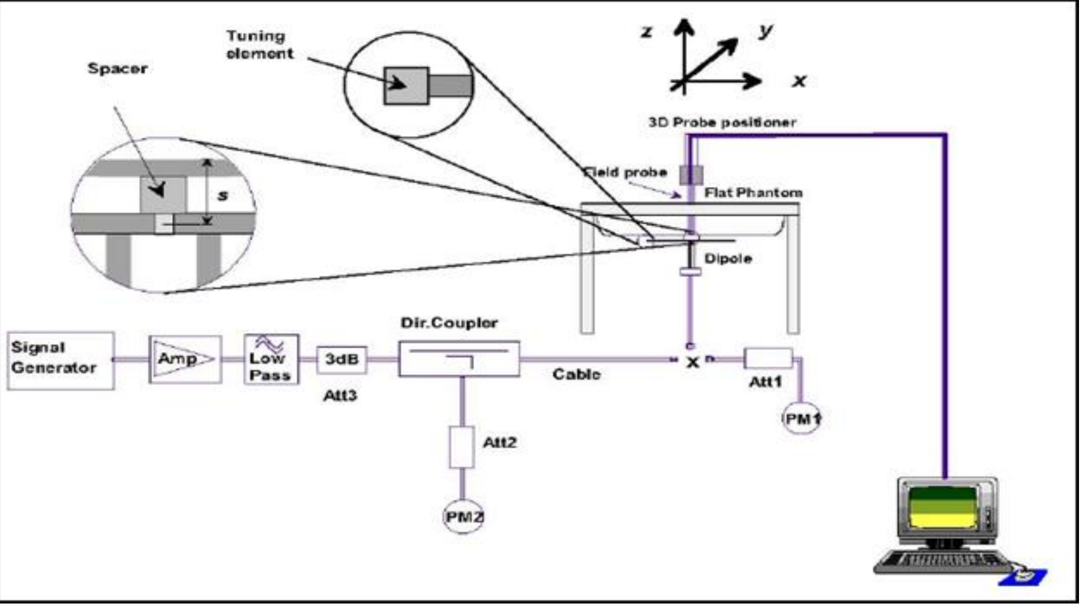
System Check	Target SAR (1W)		Measured SAR (Normalized to 1W)		Deviation (Within +/-10%)		Liquid Temp.	Test Date
	1-g (W/kg)	10-g (W/kg)	1-g (W/kg)	10-g (W/kg)	Δ1-g	Δ10-g		
2450MHz Body	50.60	23.80	48.80	22.48	-3.56%	-5.55%	21.4°C	2017/02/19
5250MHz Body	72.20	20.40	78.20	21.60	8.31%	5.88%	21.7°C	2017/02/27
5600MHz Body	76.40	21.50	82.20	22.60	7.59%	5.12%	21.7°C	2017/02/27
5750MHz Body	73.20	20.60	73.50	20.20	0.41%	-1.94%	21.7°C	2017/02/27

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

The overall diagonal dimension of the tablet is > 20 cm. Per FCC KDB616217D04, the back side and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR Exclusion Threshold in FCC KDB 447498D01 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

The device does not have telephone receiver. Next to the ear operation is not supported. Voice mode is limited to speaker mode and headset operations only, so additional Head SAR testing for this type of voice use is not required per KDB616217D04.

6.2 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. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. The test procedures in KDB 248227D01 are applied.

6.2.1 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.

6.2.2 Initial Test Configuration Procedure

An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required (see section 5.3.2 of KDB 248227D01). SAR test reduction of subsequent highest output test channels is based on the *reported* SAR of the initial test configuration.

For next to the ear, hotspot mode and UMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR measurement using the initial test configuration transmission mode. For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration.

When the *reported* SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for the subsequent next highest measured output power channel(s) in the initial test configuration until the *reported* SAR is ≤ 1.2 W/kg or all required channels are tested.

6.2.3 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.

6.2.4 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 248227D01v02) 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 248227D01v02r02). 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.

C) SAR Test Requirements for OFDM configurations

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

6.2.5 WiFi 5G SAR Test Procedures

A) U-NII-1 and U-NII-2A Bands

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

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, both bands are tested independently for SAR.

2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, both bands are tested independently for SAR.

3) The two U-NII bands may be aggregated to support a 160 MHz channel on channel number 50. Without additional testing, the maximum output power for this is limited to the lower of the maximum output power certified for the two bands. When SAR measurement is required for at least one of the bands and the highest reported SAR adjusted by the ratio of specified maximum output power of aggregated to standalone band is > 1.2 W/kg, SAR is required for the 160 MHz channel. This procedure does not apply to an aggregated band with maximum output higher than the standalone band(s); the aggregated band must be tested independently for SAR. SAR is not required when the 160 MHz channel is operating at a reduced maximum power and also qualifies for SAR test exclusion.

B) U-NII-2C and U-NII-3 Bands

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

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

C) OFDM Transmission Mode SAR Test Configuration and Channel Selection Requirements

The initial test configuration for 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures. When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.

1) The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.

2) If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.

3) If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.

4) When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n.

After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following. These channel selection procedures apply to both the initial test configuration and subsequent test configuration(s), with respect to the default power measurement procedures or additional power measurements required for further SAR test reduction. The same procedures also apply to subsequent highest output power channel(s) selection.

1) The channel closest to mid-band frequency is selected for SAR measurement.

2) For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.

D) SAR Test Requirements for OFDM configurations

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

6.3 Proximity sensor power reduction Configurations

Per KDB616217, this device uses a proximity sensor that shares the same metallic electrode as the main transmitting antenna to facilitate triggering in typical user interactivity with the device.
Due to the operating configurations and exposure conditions required by the device, the proximity sensor is used to indicate when the device is held close to a user's body exposure condition. It utilizes the proximity sensor to reduce the output power in specific wireless and operating modes of main antenna to ensure SAR compliance.
WiFi sensor power reducing mechanism need detect the WiFi connect state to make sure if it is necessary to set WiFi Tx-power back-off. In test lab environment, the Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools per KDB248227. In order to validate the power change before and after sensor power reduction in WiFi non signaling mode, a specific external test software and chipset based internal test modes are used in sensor triggering power measurement validation tests.
In the sensor triggering power measurement tests, WiFi power controlling logic for WiFi non signaling mode is the same as WiFi signaling mode. The specific external test software and chipset based internal test modes only make sure that proximity sensor logic can be triggered in WiFi non signaling mode, and do not modify any settings in the phone. It can be ensured that the unmodified settings in production units, including maximum output power, amplifier gain and other RF performance or tuning parameters, are used for SAR measurement per KDB248227.
The following tables summerize the key power reduction information for proximity sensor. The test procedures in KDB 616217 should be applied to determine proximity sensor triggering distances, and sensor coverage for normal and tilt positions. To ensure all production units are compliant, it is generally necessary to reduce the triggering distance determined from the triggering tests by 1 mm, or more if it is necessary, and use the smallest distance for movements to and from the phantom, minus 1 mm, as the sensor triggering distance for determining the SAR measurement distance.

Band	Sensor Trigger Distance	Power Reduction Amount(dB) Sensor on
WiFi 2.4G 11b	Back side:9mm Top side:9mm	6
WiFi 2.4G 11g	Back side:9mm Top side:9mm	5
WiFi 2.4G 11n(20M)	Back side:9mm Top side:9mm	5
WiFi 5G 11a	Back side:9mm Top side:9mm	5
WiFi 5G 11n(20M)	Back side:9mm Top side:9mm	5
WiFi 5G 11n(40M)	Back side:9mm Top side:9mm	3

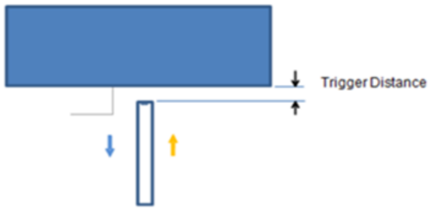
Note: Since the capacitive proximity sensor triggering distance for the back and top side are 9mm, a conservative distance of 8mm was requried for addtional SAR test at maximum power level with sensor off.

1) Procedures for determining proximity sensor triggering distances

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

the proximity sensor triggering distance measurement method are as below:

Picture:Proximity sensor trigging distances assesment for the back side

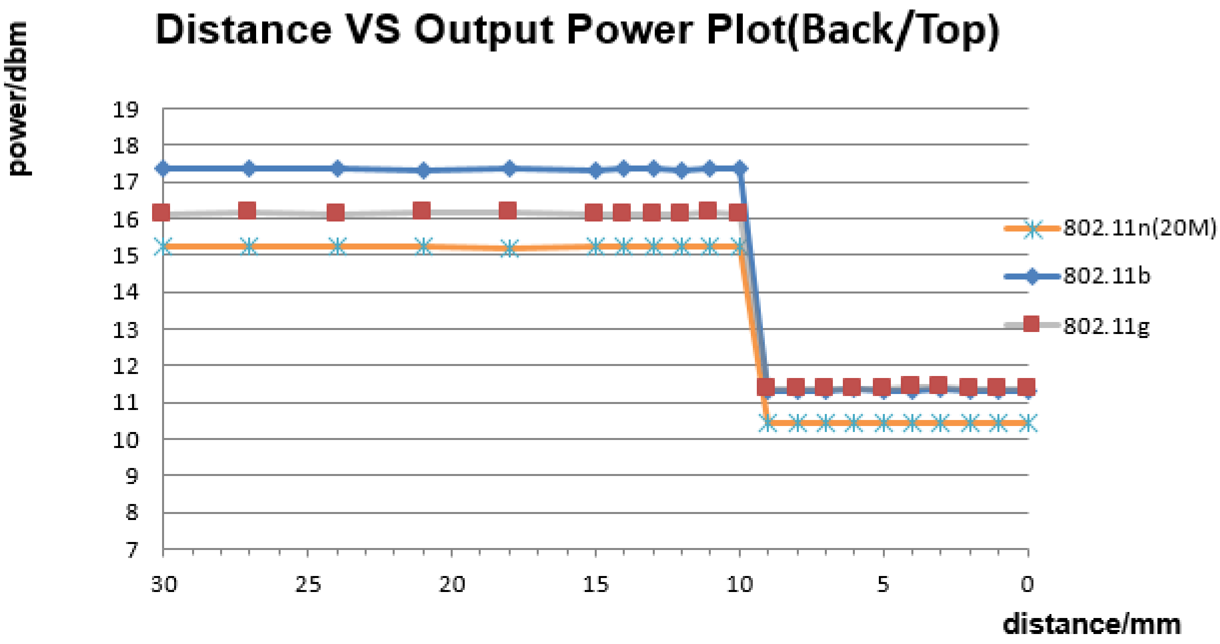


Picture:Proximity sensor trigging distances assesment for the Top side

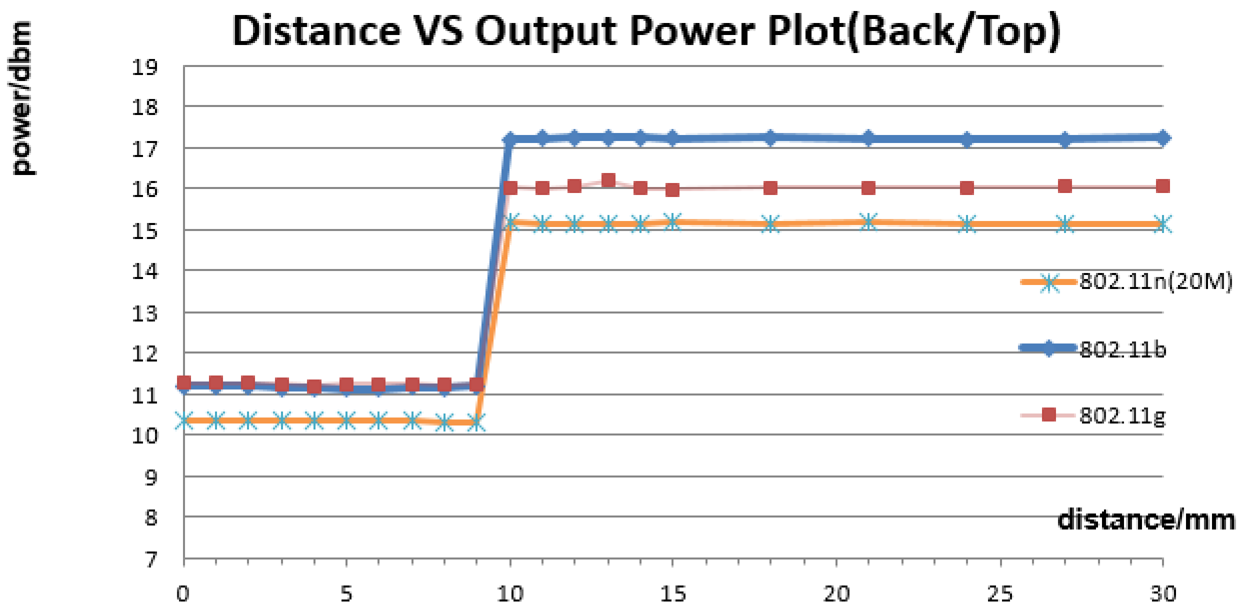
Table: Summary of Trigger Distances

Band(MHz)	Trigger distance-Back and Top Side	
	Moving toward phantom	Moving away from phantom
WiFi 2.4G 11b	9mm	9mm
WiFi 2.4G 11g	9mm	9mm
WiFi 2.4G 11n(20M)	9mm	9mm
WiFi 5G 11a	9mm	9mm
WiFi 5G 11n(20M)	9mm	9mm
WiFi 5G 11n(40M)	9mm	9mm

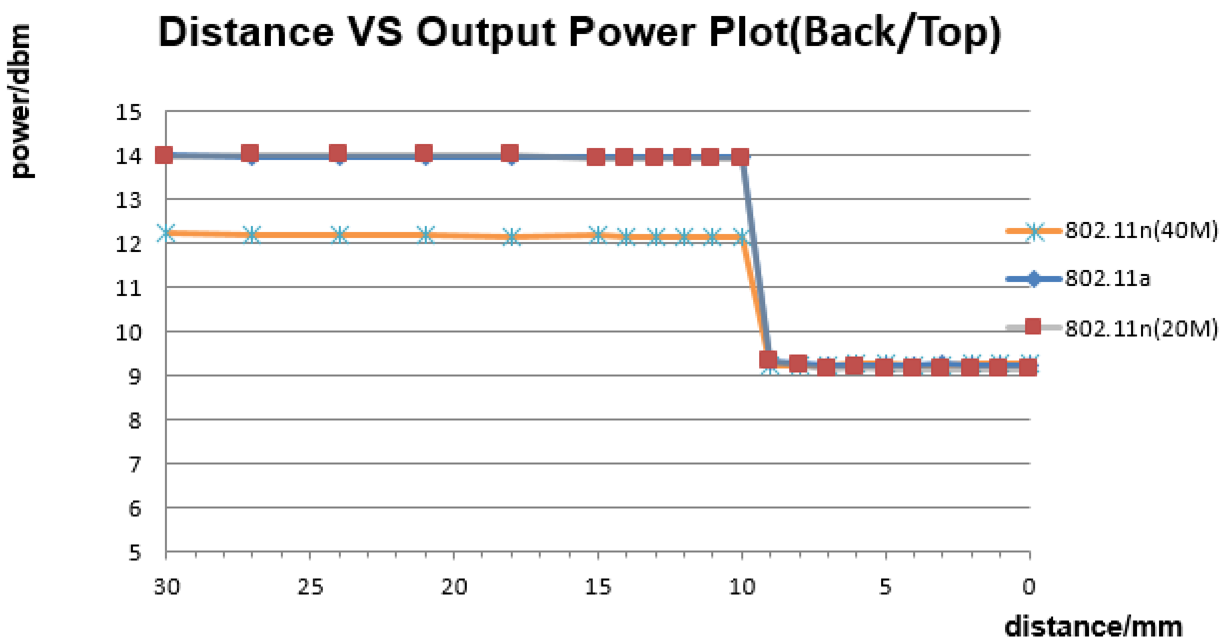
The detailed conducted power measurement data to determine the triggering distances is as below:
The DUT(back side,top side of WiFi 2.4G) is moved towards the flat phantom:



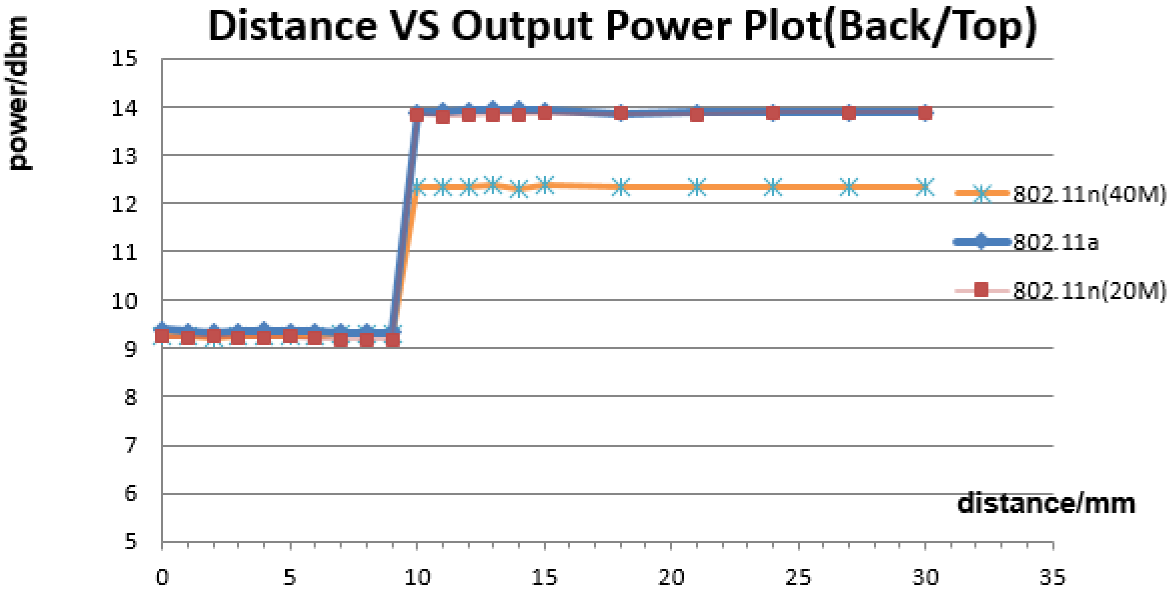
The DUT(back side,top side of WiFi 2.4G) is moved away from the flat phantom:



The DUT(back side,top side of WiFi 5G) is moved towards the flat phantom:



The DUT(back side,top side of WiFi 5G) is moved away from the flat phantom:



Conclusion: It can be ensured that the proximity sensor can be valid triggered for the body exposure condition(WiFi 2.4G/5G bands of WiFi Antenna).

2) Procedures for determining antenna and proximity sensor coverage

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

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

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

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

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

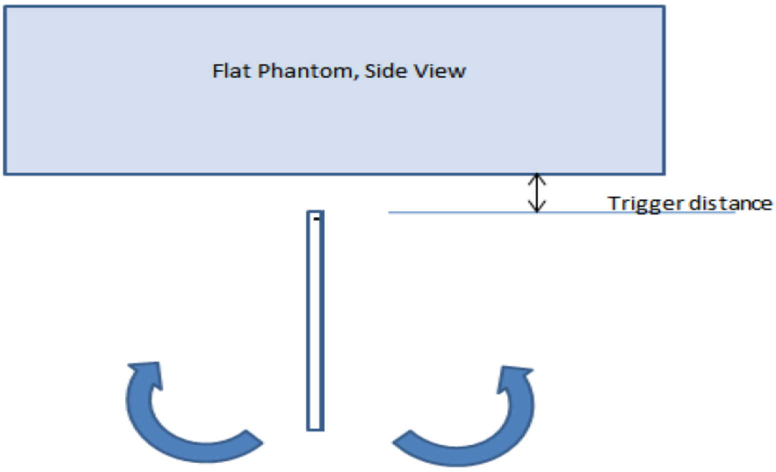


Table: Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering(Back and Top side)

Band(MHz)	Minimum trigger distance at which power reduction was maintained over ±45°	Power Reduction Status										
		-45°	-35°	-25°	-15°	-5°	0°	5°	15°	25°	35°	45°
WiFi 2.4G 11b	9mm	on	on	on	on	on	on	on	on	on	on	on
WiFi 2.4G 11g	9mm	on	on	on	on	on	on	on	on	on	on	on
WiFi 2.4G 11n(20M)	9mm	on	on	on	on	on	on	on	on	on	on	on
WiFi 5G 11a	9mm	on	on	on	on	on	on	on	on	on	on	on
WiFi 5G 11n(20M)	9mm	on	on	on	on	on	on	on	on	on	on	on
WiFi 5G 11n(40M)	9mm	on	on	on	on	on	on	on	on	on	on	on

Conclusion: It can be ensured that the proximity sensor can be valid triggered for the DUT tilt coverage exposure condition (WiFi 2.4G/5G bands of WiFi Antenna).

SAR test Plan:

1) Since the capacitive proximity sensor triggering distance for the Back/Top side is 9 mm , a conservative distance of 8 mm was requried for addtional SAR test at maximum power level with sensor off per KDB 616217.

2) SAR tests with proximity sensor power reduction are only required for the sides of frequency bands in the table above. For the other sides or other frequency bands of the device, SAR is still tested at the maximum power level with sensor off.

6.4 BT Test Configuration

For BT testing, the EUT's BT test mode is open and the EUT is connected with N4010A which provides continuous transmitting RF signal with maximum output power.

7 SAR Measurement Results

7.1.1 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	18.5	17.44	No
	6	2437		18.5	**17.65**	Yes
	11	2462		18.5	17.64	No
802.11g	1	2412	6	17.5	Not required	No
	6	2437		17.5	Not required	No
	11	2462		17.5	Not required	No
802.11n 20M	1	2412	6.5	16.5	Not required	No
	6	2437		16.5	Not required	No
	11	2462		16.5	Not required	No

Table 7: Conducted power measurement results of WiFi 2.4G(Full power)

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11b	1	2412	1	12.5	11.26	Yes
	6	2437		12.5	11.42	Yes
	11	2462		12.5	**11.45**	Yes
802.11g	1	2412	6	12.5	11.30	Yes
	6	2437		12.5	11.43	Yes
	11	2462		12.5	11.20	Yes
802.11n 20M	1	2412	6.5	11.5	Not required	No
	6	2437		11.5	Not required	No
	11	2462		11.5	Not required	No

Table 8: Conducted power measurement results of WiFi 2.4G(Sensor on)

Note: 1) The Average conducted power of WiFi is measured with RMS detector.

7.1.2 Conducted power measurements of WiFi 5G

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11a	**Ant1**	CH 36	5180	6	15.50	14.33	No
		CH 40	5200			14.02	No
		CH 44	5220			14.41	No
		CH 48	5240			14.02	No
		CH 52	5260			14.13	No
		CH 56	5280			13.75	No
		CH 60	5300			14.12	No
		CH 64	5320			**14.22**	Yes
		CH 100	5500			13.52	No
		CH 104	5520			13.99	No
		CH 108	5540			13.53	No
		CH 112	5560			13.55	No
		CH 116	5580			13.99	No
		CH 120	5600			13.58	No
		CH 124	5620			14.15	No
		CH 128	5640			13.71	No
		CH 132	5660			14.06	No
		CH 136	5680			13.52	No
		CH 140	5700			13.56	No
		CH 144	5720			13.67	No
		CH 149	5745			13.66	No
		CH 153	5765			13.75	No
		CH 157	5785			14.37	No
		CH 161	5805			13.96	No
		CH 165	5825			13.97	No

Table 9: Conducted power measurement results of WiFi 5G 802.11a (Full power).

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11n 20M (5GHz)	**Ant1**	CH 36	5180	6.5	15.50	13.95	No
		CH 40	5200			14.50	No
		CH 44	5220			14.10	No
		CH 48	5240			14.05	No
		CH 52	5260			14.15	No
		CH 56	5280			13.78	No
		CH 60	5300			14.20	No
		CH 64	5320			13.68	No
		CH 100	5500			13.53	No
		CH 104	5520			13.97	No
		CH 108	5540			13.57	No
		CH 112	5560			13.53	No
		CH 116	5580			13.95	No
		CH 120	5600			13.58	No
		CH 124	5620			13.57	No
		CH 128	5640			14.18	No
		CH 132	5660			13.60	No
		CH 136	5680			13.97	No
		CH 140	5700			13.57	No
		CH 144	5720			14.05	No
		CH 149	5745			14.17	No
		CH 153	5765			13.75	No
		CH 157	5785			13.82	No
		CH 161	5805			14.10	No
		CH 165	5825			14.18	No

Table 10: Conducted power measurement results of WiFi 5G 802.11n 20M (Full power).

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11n 40M (5GHz)	**Ant1**	CH 38	5190	13.5	13.50	Not required	No
		CH 46	5230			Not required	No
		CH 54	5270			Not required	No
		CH 62	5310			Not required	No
		CH 102	5510			Not required	No
		CH 110	5550			Not required	No
		CH 118	5590			Not required	No
		CH 126	5630			Not required	No
		CH 134	5670			Not required	No
		CH 142	5710			Not required	No
		CH 151	5755			Not required	No
		CH 159	5795			Not required	No

Table 11: Conducted power measurement results of WiFi 5G 802.11n 40M (Full power).

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11a	**Ant1**	CH 36	5180	6	10.50	9.63	No
		CH 40	5200			9.22	No
		CH 44	5220			9.82	No
		CH 48	5240			9.09	No
		CH 52	5260			9.38	Yes
		CH 56	5280			8.94	Yes
		CH 60	5300			**9.47**	Yes
		CH 64	5320			8.95	Yes
		CH 100	5500			9.08	No
		CH 104	5520			9.36	No
		CH 108	5540			9.33	No
		CH 112	5560			9.28	No
		CH 116	5580			9.08	No
		CH 120	5600			9.21	No
		CH 124	5620			9.32	No
		CH 128	5640			8.75	No
		CH 132	5660			9.15	No
		CH 136	5680			9.25	No
		CH 140	5700			9.20	No
		CH 144	5720			9.22	No
		CH 149	5745			9.03	No
		CH 153	5765			8.67	No
		CH 157	5785			9.17	No
		CH 161	5805			8.92	No
		CH 165	5825			9.46	No

Table 12: Conducted power measurement results of WiFi 5G 802.11a (Sensor on).

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11n 20M (5GHz)	**Ant1**	CH 36	5180	6.5	10.50	9.73	No
		CH 40	5200			9.09	No
		CH 44	5220			9.84	No
		CH 48	5240			9.12	No
		CH 52	5260			**9.46**	Yes
		CH 56	5280			9.30	Yes
		CH 60	5300			8.93	Yes
		CH 64	5320			9.47	Yes
		CH 100	5500			9.05	No
		CH 104	5520			8.80	No
		CH 108	5540			9.23	No
		CH 112	5560			8.67	No
		CH 116	5580			9.21	No
		CH 120	5600			8.80	No
		CH 124	5620			9.18	No
		CH 128	5640			8.83	No
		CH 132	5660			9.25	No
		CH 136	5680			9.08	No
		CH 140	5700			8.65	No
		CH 144	5720			9.28	No
		CH 149	5745			8.97	No
		CH 153	5765			8.62	No
		CH 157	5785			8.87	No
		CH 161	5805			9.42	No
		CH 165	5825			9.10	No

Table 13: Conducted power measurement results of WiFi 5G 802.11n 20M (Sensor on).

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11n 40M (5GHz)	**Ant1**	CH 38	5190	13.5	10.50	9.69	No
		CH 46	5230			9.61	No
		CH 54	5270			**9.61**	Yes
		CH 62	5310			**9.32**	Yes
		CH 102	5510			9.25	No
		CH 110	5550			**9.27**	Yes
		CH 118	5590			**9.26**	Yes
		CH 126	5630			9.24	No
		CH 134	5670			8.77	No
		CH 142	5710			9.17	No
		CH 151	5755			**8.95**	Yes
		CH 159	5795			**8.90**	Yes

Table 14: Conducted power measurement results of WiFi 5G 802.11n 40M (Sensor on).

7.1.3 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	9.00	8.17	7.06	7.53
2DH5	9.00	5.23	4.24	4.59
3DH5	9.00	5.20	4.30	4.60

BT 2450	Tune-up	Average Conducted Power (dBm)		
		0CH	19CH	39CH
BT BLE	9.00	**7.90**	**8.34**	**8.03**

Table 15: 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 D01v06, all SAR measurement results are scaled to the maximum tune-up tolerance limit to demonstrate SAR compliance.

2) Per KDB447498 D01v06, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8W/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 D01v01r04,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 KDB865664 D02v01r01, 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 the blue SAR test results in the tables of Section 7.3 and appendix B for detailed SAR plots).

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 447498D01. 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) For WiFi 2.4G , SAR is measured for 2.4 GHz 802.11b DSSS using the initial test position procedure. SAR is not required for the 2.4 GHz 802.11g/n OFDM conditions when KDB Publication 447498 SAR test exclusion applies to the OFDM configuration or 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.

7.2.1 SAR measurement Result of WiFi 2.4G

Test Position of Body	Test channel /Freq.(MHz)	Test Mode	Test Dist. (mm)	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR1-g (W/kg)
				1-g Area Scan	1-g Zoom Scan				
SAR test data with sensor on									
Back Side	11/2462	802.11 b	0	0.958	0.980	0.150	11.45	12.50	1.248
Back Side	1/2412	802.11 b	0	0.672	0.735	0.000	11.26	12.50	0.978
Back Side	6/2437	802.11 b	0	1.060	1.070	0.000	11.42	12.50	1.372
Top Side	11/2462	802.11 b	0	0.217	0.221	0.060	11.45	12.50	0.281
Back Side	6/2437	802.11 g	0	0.966	0.995	0.000	11.43	12.50	1.273
Back Side	1/2412	802.11 g	0	1.040	**1.080**	0.000	11.30	12.50	1.424
Back Side with Headset	1/2412	802.11 g	0	0.683	0.757	0.000	11.30	12.50	0.998
Back Side-Repeated	1/2412	802.11 g	0	1.040	0.985	0.000	11.30	12.50	1.298
Back Side-holder perturbation verification	1/2412	802.11 g	0	0.908	0.973	0.010	11.30	12.50	1.283
Back Side	11/2462	802.11 g	0	1.010	1.030	0.000	11.20	12.50	1.389
Top Side	6/2437	802.11 g	0	0.291	0.299	0.110	11.43	12.50	0.383
SAR test data with sensor off									
Back Side	6/2437	802.11 b	8	0.496	0.519	-0.080	17.65	18.50	0.631
Top Side	6/2437	802.11 b	8	0.272	0.278	0.040	17.65	18.50	0.338
Right Side	6/2437	802.11 b	0	0.181	0.198	0.070	17.65	18.50	0.241

Table 16: Body SAR test results of WiFi 2.4G

Note: * According to 201610 FCC TCB workshop RF exposure slides, when the highest reported SAR of an antenna is > 1.2 W/kg, holder perturbation verification is required for each antenna, using the highest SAR configuration among all applicable frequency bands.

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 Mode	Duty cycle [%]
802.11b	96.70
802.11g	96.70
802.11n(20M)	96.70

Table 17:The duty factor of WiFi 2.4G

Test Position of Body	Test channel / Freq.(MHz)	Test Mode	Test Dist. (mm)	Scaled SAR_{1-g} (W/kg)	Actual duty factor	Maximum duty factor	Reported SAR_{1-g} (W/kg)
SAR test data with sensor on							
Back Side	11/2462	802.11 b	0	1.248	96.70%	100%	1.291
Back Side	1/2412	802.11 b	0	0.978	96.70%	100%	1.011
Back Side	6/2437	802.11 b	0	1.372	96.70%	100%	1.419
Top Side	11/2462	802.11 b	0	0.281	96.70%	100%	0.291
Back Side	6/2437	802.11 g	0	1.273	96.70%	100%	1.316
Back Side	1/2412	802.11 g	0	1.424	96.70%	100%	**1.472**
Back Side with Headset	1/2412	802.11 g	0	0.998	96.70%	100%	1.032
Back Side-Repeated	1/2412	802.11 g	0	1.298	96.70%	100%	1.343
Back Side-holder perturbation verification	1/2412	802.11 g	0	1.283	96.70%	100%	1.326
Back Side	11/2462	802.11 g	0	1.389	96.70%	100%	1.437
Top Side	6/2437	802.11 g	0	0.383	96.70%	100%	0.396
SAR test data with sensor off							
Back Side	6/2437	802.11 b	8	0.631	96.70%	100%	0.653
Top Side	6/2437	802.11 b	8	0.338	96.70%	100%	0.350
Right Side	6/2437	802.11 b	0	0.241	96.70%	100%	0.249

Table 18: Body SAR test results of WiFi 2.4G(scaled to 100% transmission duty factor)

Mode	Tune-up (dBm)	Tune-up (mW)	Hightest Reported SAR(W/kg)	Adjusted SAR (W/kg)	SAR test
802.11b	12.50	17.78	1.419	/	Yes
802.11g	12.50	17.78	/	1.419	Yes
802.11n 20M	11.50	14.13	/	1.127	No

Table 19: Adjusted SAR for WiFi 2.4G (sensor on)

Note: SAR is required for the 2.4 GHz 802.11g/n OFDM conditions 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, so SAR for 802.11g is required and SAR for 802.11n(20M) is not required.

Mode	Tune-up (dBm)	Tune-up (mW)	Hightest Reported SAR(W/kg)	Adjusted SAR (W/kg)	SAR test
802.11b	18.50	70.79	0.653	/	Yes
802.11g	17.50	56.23	/	0.519	No
802.11n 20M	16.50	44.67	/	0.412	No

Table 20: Adjusted SAR for WiFi 2.4G (sensor off)

Note: SAR is not required for the 2.4 GHz 802.11g/n OFDM conditions 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.

7.2.2 SAR measurement Result of WiFi 5G

Test Position of Body	Test channel /Freq. (MHz)	Test Mode	Test Dist. (mm)	SAR Value (W/kg)		Power Drift (dB)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR1-g (W/kg)
				1-g Area Scan	1-g Zoom Scan				
SAR test data with sensor on									
Test data of U-NII-2A Band									
Back Side	54/5270	802.11n(40M)	0	0.420	0.463	0.000	9.61	10.50	0.568
Top Side	54/5270	802.11n(40M)	0	0.612	0.743	0.160	9.61	10.50	0.912
Top Side	62/5310	802.11n(40M)	0	0.628	**0.883**	-0.090	9.32	10.50	1.159
Top Side-Repeated	62/5310	802.11n(40M)	0	0.758	0.866	0.180	9.32	10.50	1.136
Test data of U-NII-2C Band									
Back Side	110/5550	802.11n(40M)	0	0.462	0.486	0.000	9.27	10.50	0.645
Top Side	110/5550	802.11n(40M)	0	0.567	0.747	0.120	9.27	10.50	0.992
Top Side	118/5590	802.11n(40M)	0	0.636	0.733	0.060	9.26	10.50	0.975
Test data of U-NII-3 Band									
Back Side	151/5755	802.11n(40M)	0	0.352	0.420	0.000	8.95	10.50	0.600
Top Side	151/5755	802.11n(40M)	0	0.512	0.659	-0.190	8.95	10.50	0.942
Top Side	159/5795	802.11n(40M)	0	0.566	0.673	-0.150	8.90	10.50	0.973
Additional SAR test at the worst case band with sensor off									
Back Side	64/5320	802.11a	8	0.267	/	0.000	14.22	15.50	/
Top Side	64/5320	802.11a	8	0.515	0.524	-0.070	14.22	15.50	0.704

Table 21: Body SAR test results of WiFi 5GHz

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

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 Mode	Duty cycle [%]
802.11a	97.49
802.11n (20M)	97.49
802.11n (40M)	97.49

Table 22:The duty factor of WiFi 5G

Test Position of Body	Test channel / Freq. (MHz)	Test Mode	Test Dist. (mm)	Scaled SAR_{1-g} (W/kg)	Actual duty factor	Maximum duty factor	Reported SAR_{1-g} (W/kg)
SAR test data with sensor on							
Test data of U-NII-2A Band							
Back Side	54/5270	802.11n(40M)	0	0.568	97.49%	100%	0.583
Top Side	54/5270	802.11n(40M)	0	0.912	97.49%	100%	0.935
Top Side	62/5310	802.11n(40M)	0	1.159	97.49%	100%	**1.189**
Top Side-Repeated	62/5310	802.11n(40M)	0	1.136	97.49%	100%	1.166
Test data of U-NII-2C Band							
Back Side	110/5550	802.11n(40M)	0	0.645	97.49%	100%	0.662
Top Side	110/5550	802.11n(40M)	0	0.992	97.49%	100%	1.017
Top Side	118/5590	802.11n(40M)	0	0.975	97.49%	100%	1.000
Test data of U-NII-3 Band							
Back Side	151/5755	802.11n(40M)	0	0.600	97.49%	100%	0.616
Top Side	151/5755	802.11n(40M)	0	0.942	97.49%	100%	0.966
Top Side	159/5795	802.11n(40M)	0	0.973	97.49%	100%	0.998
Additional SAR test at the worst case band with sensor off							
Back Side	64/5320	802.11a	8	0.285	97.49%	100%	0.292
Top Side	64/5320	802.11a	8	0.704	97.49%	100%	0.722

Table 23: Body SAR test results of WiFi 5GHz (scaled to 100% transmission duty factor)

Mode	Tune-up（dBm）	Tune-up（mW）	Hightest Reported SAR(W/kg)	Adjusted SAR (W/kg)	SAR test
802.11n 40M	10.5	11.22	1.189	/	Yes
802.11a	10.5	11.22	/	1.189	No
802.11n 20M	10.5	11.22	/	1.189	No

Table 24: Adjusted SAR for WiFi 5G (sensor on)

Note:

1) The 802.11n(40M) mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power and bandwidth.

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

Mode	Tune-up （dBm）	Tune-up （mW）	Hightest Reported SAR(W/kg)	Adjusted SAR (W/kg)	SAR test
802.11a	15.5	35.48	0.705	/	Yes
802.11n 20M	15.5	35.48	/	0.705	No
802. 11n 40M	13.5	22.39	/	0.445	No

Table 25: Adjusted SAR for WiFi 5G (full power)

Note:

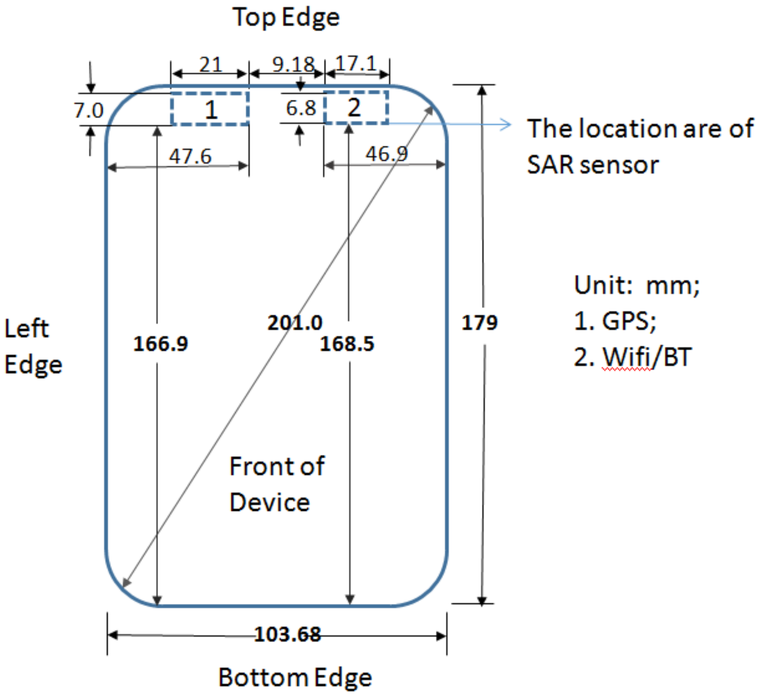
1)The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power.

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

7.3 Multiple Transmitter Evaluation

The following tables list information which is relevant for the decision if a simultaneous transmit evaluation is necessary according to FCC KDB 447498 D01 General RF Exposure Guidance v06.

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



Note:

1) Per KDB 616217, because the diagonal Length is ＞200mm, it is considered a “ tablet” device and need to test 0mm 1g Body SAR.

2) WiFi 2.4G, WiFi 5G and BT can’t transmit simultaneously.

7.3.1 Standalone SAR exclusion calculation

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

2) At 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following

a) [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz

b) [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm) • 10] mW at > 1500 MHz and ⩽ 6 GHz

(Antenna to adjacent sides<50mm)

Band	Exposure Condition	f(GHz)	Pmax	Pmax	Seperation Distance(mm)					Calculated Value					SAR Test(yes or no)				
			(dBm)*	(mW)	Back side	Left side	Right side	Top side	Bottom side	Back side	Left side	Right side	Top side	Bottom side	Back side	Left side	Right side	Top side	Bottom side
WiFi 2.4G	Body 0mm	2.450	18.50	70.79	5.0	56.8	29.8	5.0	168.5	22.162	>50mm	3.718	22.162	>50mm	Yes	>50mm	Yes	Yes	>50mm
WiFi 5.2G	Body 0mm	5.800	15.50	35.48	5.0	56.8	29.8	5.0	168.5	17.090	>50mm	2.867	17.090	>50mm	Yes	>50mm	No	Yes	>50mm
WiFi 5.3G	Body 0mm	5.800	15.50	35.48	5.0	56.8	29.8	5.0	168.5	17.090	>50mm	2.867	17.090	>50mm	Yes	>50mm	No	Yes	>50mm
WiFi 5.5G	Body 0mm	5.800	15.50	35.48	5.0	56.8	29.8	5.0	168.5	17.090	>50mm	2.867	17.090	>50mm	Yes	>50mm	No	Yes	>50mm
WiFi 5.8G	Body 0mm	5.800	15.50	35.48	5.0	56.8	29.8	5.0	168.5	17.090	>50mm	2.867	17.090	>50mm	Yes	>50mm	No	Yes	>50mm
BT	Body 0mm	2.450	9.00	7.94	5.0	56.8	29.8	5.0	168.5	2.487	>50mm	0.417	2.487	>50mm	No	>50mm	No	No	>50mm

(Antenna to adjacent sides >50mm)

Band	Exposure Condition	f(GHz)	Pmax	Pmax	Seperation Distance(mm)					Calculated Threshold Value					SAR Test(yes or no)				
			(dBm)*	(mW)	Back side	Left side	Right side	Top side	Bottom side	Back side	Left side	Right side	Top side	Bottom side	Back side	Left side	Right side	Top side	Bottom side
WiFi 2.4G	Body 0mm	2.450	18.50	70.79	5.0	56.8	29.8	5.0	168.5	<50mm	164.00	<50mm	<50mm	1281.00	<50mm	No	<50mm	<50mm	No
WiFi 5.2G	Body 0mm	5.800	15.50	35.48	5.0	56.8	29.8	5.0	168.5	<50mm	164.00	<50mm	<50mm	1281.00	<50mm	No	<50mm	<50mm	No
WiFi 5.3G	Body 0mm	5.800	15.50	35.48	5.0	56.8	29.8	5.0	168.5	<50mm	164.00	<50mm	<50mm	1281.00	<50mm	No	<50mm	<50mm	No
WiFi 5.5G	Body 0mm	5.800	15.50	35.48	5.0	56.8	29.8	5.0	168.5	<50mm	130.00	<50mm	<50mm	1247.00	<50mm	No	<50mm	<50mm	No
WiFi 5.8G	Body 0mm	5.800	15.50	35.48	5.0	56.8	29.8	5.0	168.5	<50mm	130.00	<50mm	<50mm	1247.00	<50mm	No	<50mm	<50mm	No
BT	Body 0mm	2.450	9.00	7.94	5.0	56.8	29.8	5.0	168.5	<50mm	164.00	<50mm	<50mm	1281.00	<50mm	No	<50mm	<50mm	No

Note :According to the table above,

1) WiFi 2.4G SAR test is only required for Top side , Back side, Right side .

2) WiFi 5G SAR test is required for Top side , Back side.

3) BT SAR test is not required for all sides.

7.3.2 Simultaneous Transmission Conlcusion

The device only has one WiFi/BT Tx antenna. WiFi 2.4G, WiFi 5G and BT can't transmit simultaneously therefore simultaneous transmission SAR is not required per KDB 447498 D01.

Appendix A. System Check Plots

(Pls See Appendix No.: SYBH(Z-SAR)003022017-2A, total: 5 pages)

Appendix B. SAR Measurement Plots

(Pls See Appendix No.: SYBH(Z-SAR)003022017-2B, total: 3 pages)

Appendix C. Calibration Certificate

(Pls See Appendix No.: SYBH(Z-SAR)003022017-2C, total: 50 pages)

Appendix D. Photo documentation

(Pls See Appendix No.: SYBH(Z-SAR)003022017-2D, total: 5 pages)

End