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FCC SAR Compliance Test Report

Product Name: HUAWEI MateBook

Model: MACHR-W29, MACHR-W19

Report No.: SYBH(Z-SAR)20190123011002-2

FCC ID: QISMACHR-WX9

	APPROVED (Lab Manager)	PREPARED (Test Engineer)
BY	<i>Wei Manbin</i>	<i>Lin Jiekai</i>
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Reliability Laboratory of Huawei Technologies Co., Ltd.

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

No.2, New City Avenue, Songshan Lake Sci. & Tech. Industry Park,
Dongguan, 523808, P.R.C
Tel: +86 769 23830808 Fax: +86 769 23837628

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※ ※ Modified History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	2019-03-06	Lin Jiekai

1 General Information

1.1 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing are below Table 1.

Band	Max Reported SAR(W/kg)
	1-g Body (0mm) *
WiFi 2.4G	0.76
WiFi 5G	0.64
BT	0.11
The highest reported SAR for Body and Simultaneous transmission exposure conditions are 0.76 W/kg and 1.51 W/kg per KDB690783 D01.	

Table 1: Summary of test result

Note:

1)* For body operation, this device has been tested at a minimum of 0mm from the body per FCC KDB616217.

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

1.2 RF exposure limits

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

Table 2: RF exposure limits

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

Notes:

- * The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
- ** The Spatial Average value of the SAR averaged over the whole body.
- *** The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation

1.3 EUT Description

Device Information:			
Product Name:	HUAWEI MateBook		
Model:	MACHR-W29, MACHR-W19		
FCC ID :	QISMACHR-WX9		
SN:	1#: XMYBB18C21000036(MACHR-W29) 2#: 96GBB18C24000060(MACHR-W29) 3#: XMYBB18C21000061(MACHR-W29) 4#: XMYBB18C21000034(MACHR-W29) 5#: 8DLBB18C24000066(MACHR-W19) 6#: 99HBB18C24000052(MACHR-W19)		
Device Type :	Portable device		
Device Phase:	Identical Prototype		
Exposure Category:	Uncontrolled environment / general population		
Hardware Version :	SP2MACHRW19M		
Software Version :	1.5.0.7(C001)		
Antenna Type :	Internal antenna		
Device Operating Configurations:			
Supporting Mode(s)	WiFi 2.4G/5G, BT		
Test Modulation	WiFi(DSSS/OFDM),BT(GFSK)		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	WiFi 2.4G	2412-2462	2412-2462
	WiFi 5G	5150-5250	5150-5250
		5250-5350	5250-5350
		5470-5725	5470-5725
		5725-5850	5725-5850
BT	2402-2480	2402-2480	
Test Channels (low-mid-high):	802.11b/g/n 20M:1-2-6-10-11(WiFi 2.4G) 802.11n 40M:3-4-6-8-9(WiFi 2.4G)		
	802.11a/n/ac 20M: 36-40-44-48-52-56-60-64-100-104-108-112-116-120-124-128 -132-136-140-149-153-157-161-165 (WiFi 5G)		
	802.11n/ac 40M: 38-46-54-62-102-110-118-126-134-151-159 (WiFi 5G)		
	802.11ac 80M: 42-58-106-122-155 (WiFi 5G)		
	802.11ac 160M: 50-114 (WiFi 5G)		
	0-19-39-78(BT)		

Table 3: Device information and operating configuration

Note: For WiFi 5G, the device does not support channel 144(20M), channel 142(40M) and channel 138(80M).

1.3.1 General Description

MACHR-W29/MACHR-W19 is a notebook computer, Which supports 2.4G Wi-Fi, 5G Wi-Fi, and Bluetooth wireless frequency bands. It provides power and fingerprint key switch, one USB type A , two USB type C, and a earphone interfaces.

Battery information:

Name	Manufacturer/trademark	Description
Rechargeable Li-ion	Huawei Technologies Co., Ltd. (Dynapack International Technology Corp)	Model : HB4593R1ECW Rated capacity: 7410mAh Rated Voltage: 7.6V Limited Charge Voltage: 8.7V
	Huawei Technologies Co., Ltd. (Sunwoda Electronic Co., Ltd)	

Difference description:

The difference between MACHR-W29, and MACHR-W19 is show in the following table:

Model	MACHR-W29 (with GPU version)	MACHR-W29 (without GPU version)	MACHR-W19 (with GPU version)	MACHR-W19 (without GPU version)
PCB layout	The same	The same	The same	The same
Main board	The same	Delete GPU chip and related components	The same	Delete GPU chip and related components
Frequency bands	The same, support WiFi 2.4G&5G, BT 2.4G	The same, support WiFi 2.4G&5G, BT 2.4G	The same, support WiFi 2.4G&5G, BT 2.4G	The same, support WiFi 2.4G&5G, BT 2.4G
BT/ WiFi antenna	The same	The same	The same	The same
Appearance	The same	The same	The same	The same
Dimension	The same	The same	The same	The same
CPU	Whiskey lake-U i7, Support max 4.6GHz	Whiskey lake-U i7, Support max 4.6GHz	Whiskey lake-U i5, Support max 3.9GHz	Whiskey lake-U i5, Support max 3.9GHz
GPU	Support	Not support	Support	Not support
Memory	16/8G	16/8G	8G	8G
SSD	512G/1T	512G/1T	256G/512G	256G/512G
Rear camera	Not support	Not support	Not support	Not support
Front camera	The same	The same	The same	The same
Adapter	The same	The same	The same	The same
Battery	The same	The same	The same	The same
Accessories	The same	The same	The same	The same

According to the difference description above:

- 1) Full SAR test is performed on MACHR-W29 (with GPU version).
- 2) MACHR-W29 (without GPU version) shares the same test data of MACHR-W29 (with GPU version) for each same frequency band.
- 3) MACHR-W19 (with GPU version) is tested at the SAR worst case of MACHR-W29 for each same frequency band.
- 4) MACHR-W19 (without GPU version) shares the same test data of MACHR-W19 (with GPU version) for each same frequency band.

1.4 Test specification(s)

ANSI C95.1:1992 /IEEE C95.1:1991	Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.
IEEE Std 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
KDB 447498 D01	General RF Exposure Guidance v06
KDB 248227 D01	SAR Guidance for IEEE 802.11 Wi-Fi SAR v02r02
KDB 865664 D01	SAR measurement 100 MHz to 6 GHz v01r04
KDB 865664 D02	RF Exposure Reporting v01r02
KDB 690783 D01	SAR Listings on Grants v01r03
KDB 616217 D04	SAR for laptop and tablets v01r02

1.5 Testing laboratory

Test Site	Reliability Laboratory of Huawei Technologies Co., Ltd.
Test Location	NO.2 New City Avenue Songshan Lake Sci. & Tech. Industry Park, Dongguan, Guangdong, P.R.C
Telephone	+86 769 23830808
Fax	+86 769 23837628
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

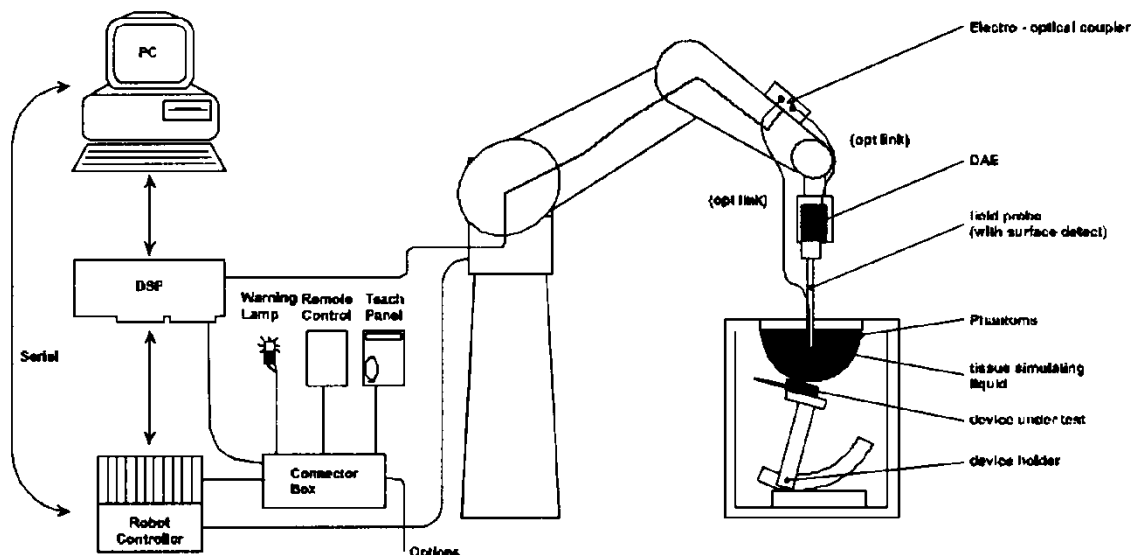
Start Date of test	2019-02-27
End Date of test	2019-03-02

1.8 Ambient Condition

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

2 SAR Measurement System

2.1 SAR Measurement Set-up



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

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

2.2 Test environment

The DASY measurement system is placed at the head end of a room with dimensions: 5 x 2.5 x 3 m³, the SAM phantom is placed in a distance of 75 cm from the side walls and 1.1m from the rear wall. Above the test system a 1.5 x 1.5 m² array of pyramid absorbers is installed to reduce reflections from the ceiling.

Picture 1 of the photo documentation shows a complete view of the test environment.

The system allows the measurement of SAR values larger than 0.005 mW/g.

2.3 Data Acquisition Electronics description

The data acquisition electronics (DAE) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converted 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.

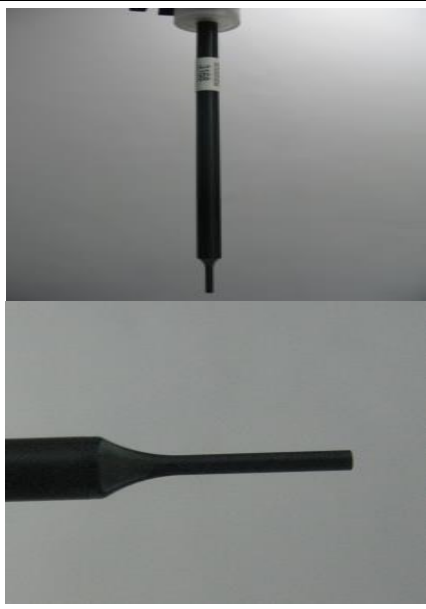
DAE

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

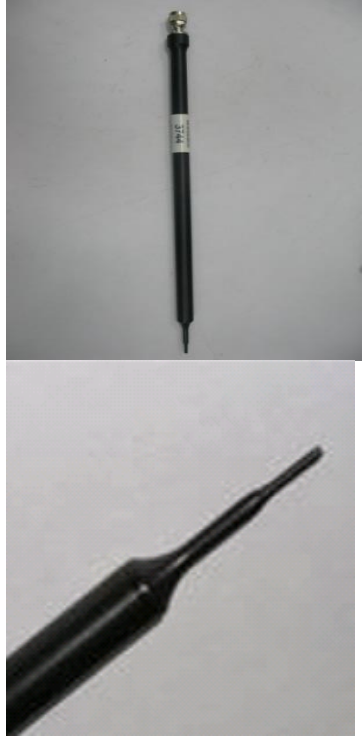
2.4 Probe description

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 μ W/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 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB (noise: typically < 1 μ W/g)	
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%	

2.5 Phantom description

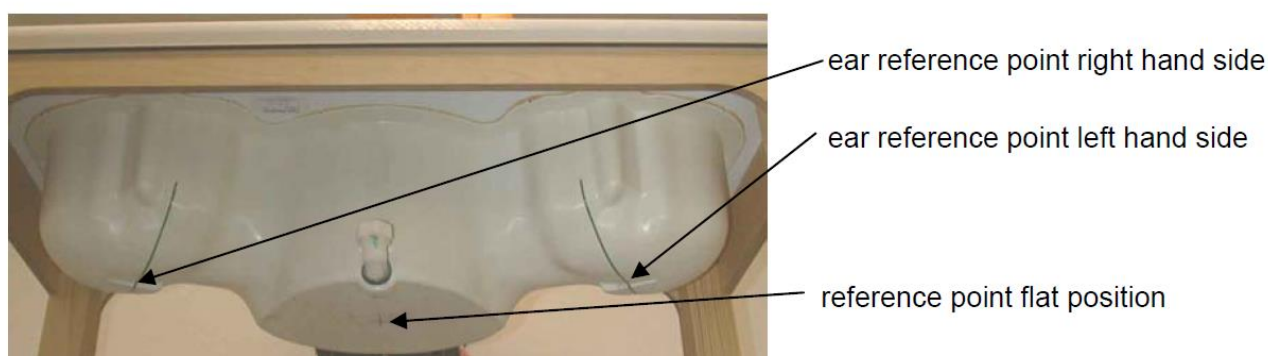
SAM Twin Phantom

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:



ELI 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 $2 \leq \epsilon_r \leq 5$ at ≤ 3 GHz, $3 \leq \epsilon_r \leq 4$ at > 3 GHz and a loss tangent ≤ 0.05 .

Modular Triple Flat Phantom

Shell Thickness (bottom plate)	2mm±0.2mm	
Filling Volume (Module)	approx. 8.1 liters (filling height: 155 mm)	
Dimensions	Length: 292 mm Width: 178 mm Height: 178 mm Useable area: 280 × 175 mm	
Measurement Areas	Flat phantom	
The Modular Flat Phantom consists of three identical modules that can be installed and removed separately without emptying the liquid. It is used for compliance testing of small wireless devices in body-worn configurations according to IEC 62209-2, etc.		

2.6 Device holder description

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



The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity $\epsilon = 3$ and loss tangent $\sigma = 0.02$. 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 $\pm 1^\circ$ 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	7505	2018-06-12	One year
☒	SPEAG	Dosimetric E-Field Probe	EX3DV4	3736	2018-04-27	One year
☒	SPEAG	2450 MHz Dipole	D2450V2	860	2018-11-17	Three years
☒	SPEAG	5GHz Dipole	D5GHzV2	1155	2018-06-08	Three years
☒	SPEAG	Data acquisition electronics	DAE4	1492	2018-11-14	One year
☒	SPEAG	Data acquisition electronics	DAE4	851	2018-07-18	One year
☒	SPEAG	Software	DASY52	N/A	NCR	NCR
☒	SPEAG	Flat Phantom	ELI	1038	NCR	NCR
☒	SPEAG	Flat Phantom	ELI	2090	NCR	NCR
☒	R & S	Universal Radio Communication Tester	CMW 500	165424	2018-07-07	One year
☒	Agilent	Network Analyser	E5071C	MY46107368	2018-10-15	One year
☒	Agilent	Dielectric Probe Kit	85070E	2484	NCR	NCR
☒	Agilent	Signal Generator	N5181A	MY50145341	2018-12-18	One year
☒	MINI-CIRCUITS	Amplifier	ZHL-42W	QA1402001	NCR	NCR
☒	MINI-CIRCUITS	Amplifier	ZVE-8G+	188163	NCR	NCR
☒	Agilent	Dual Directional Coupler	772D	MY52180173	2018-12-13	One year
☒	AR	Directional Coupler	DC7144M1	311190	2018-05-29	One year
☒	Agilent	Power Meter	E4417A	MY54100027	2018-03-24	One year
☒	Keysight	Power Meter Sensor	E9321A	MY57150002	2018-03-15	One year
☒	R & S	Power Meter	NRP	100740	2018-07-17	One year
☒	R & S	Power Meter Sensor	NRP-Z11	106288	2018-07-17	One year

Note:

1) Per KDB865664 D01 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.

- There is no physical damage on the dipole;
- System check with specific dipole is within 10% of calibrated value;
- The most recent return-loss result, measured at least annually, deviates by no more than 20% from the previous measurement.
- 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 equipment are within the valid period when the tests are performed.

3 SAR Measurement Procedure

3.1 Scanning procedure

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

- The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max. +/- 5 %.
- For power drift measurement, DASY software supports that the reference position can be either the selected section’s grid reference point or a user point. If the E-field of power reference measurement in the default grid reference point is very small, the test lab may set the reference position to the user point near the hotspot location to avoid large measurement uncertainty.
- The “surface check” measurement tests the optical surface detection system of the DASY system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above $\pm 0.1\text{mm}$). 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 $\pm 30^\circ$.)
- 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 ($\leq 2\text{GHz}$), 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: $\Delta x_{\text{zoom}}, \Delta y_{\text{zoom}} \leq 2\text{GHz} - \leq 8\text{mm}$, 2-4GHz - $\leq 5\text{ mm}$ and 4-6 GHz- $\leq 4\text{mm}$; $\Delta z_{\text{zoom}} \leq 3\text{GHz} - \leq 5\text{ mm}$, 3-4 GHz- $\leq 4\text{mm}$ and 4-6GHz- $\leq 2\text{mm}$ 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 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 KDB865664 D01:

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

3.2 Spatial Peak SAR Evaluation

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

- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting 'Graph Evaluated'.
- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.
- All neighboring volumes are evaluated until no neighboring volume with a higher average value is found.

Extrapolation

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

Interpolation

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

Volume Averaging

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

Advanced Extrapolation

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

3.3 Data Storage and Evaluation

Data Storage

The DASY software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension "DAE". 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	Dcp _i
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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

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

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

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:

$$\begin{aligned} \text{E-field probes:} \quad E_i &= (V_i / \text{Norm}_i \cdot \text{ConvF})^{1/2} \\ \text{H-field probes:} \quad H_i &= (V_i)^{1/2} \cdot (a_{i0} + a_{i1}f + a_{i2}f^2)/f \end{aligned}$$

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):

$$E_{\text{tot}} = (E_x^2 + E_y^2 + E_z^2)^{1/2}$$

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

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

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/cm³

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

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

with P_{pwe} = equivalent power density of a plane wave in mW/cm²
 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 if the dielectric parameters are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within $\pm 5\%$ of the target values.

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

Ingredients (% of weight)	Body Tissue					
Frequency Band (MHz)	750	835	1750	1900	2450	2600
Water	50.3	52.4	69.91	69.91	73.2	64.493
Salt (NaCl)	1.60	1.40	0.13	0.13	0.04	0.024
Sugar	47.0	45.0	0.0	0.0	0.0	0.0
HEC	0.0	1.0	0.0	0.0	0.0	0.0
Bactericide	0.0	0.1	0.0	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0
DGBE	0.0	0.0	29.96	29.96	26.7	32.252

Table 4: Tissue Dielectric Properties

Salt: 99+% Pure Sodium Chloride; Sugar: 98+% Pure Sucrose; Water: De-ionized, $16\text{M}\Omega$ + 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 Body Liquid (MBBL600-6000MHz), Manufactured by SPEAG:

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

Tissue Type	Target Frequency	Target Tissue		Measured Tissue		Deviation (Within +/-5%)		Test Date
		Permit-tivity	Conduc-tivity [S/m]	Permit-tivity	Conduc-tivity [S/m]	$\Delta\epsilon_r$	$\Delta\sigma$	
2450MHz Body	2410	52.8	1.91	53.09	1.965	0.55%	2.88%	2019-02-27
	2435	52.7	1.94	53.04	1.988	0.65%	2.47%	
	2450	52.7	1.95	53.02	2.003	0.61%	2.72%	
	2460	52.7	1.96	53.02	2.012	0.61%	2.65%	
2450MHz Body	2410	52.8	1.91	50.38	1.915	-4.58%	0.26%	2019-03-02
	2435	52.7	1.94	50.34	1.941	-4.48%	0.05%	
	2450	52.7	1.95	50.33	1.954	-4.50%	0.21%	
	2460	52.7	1.96	50.32	1.963	-4.52%	0.15%	
5GHz Body	5250	48.9	5.36	49.80	5.257	1.84%	-1.92%	2019-02-28
	5600	48.5	5.77	49.49	5.682	2.04%	-1.53%	
	5750	48.3	5.94	49.26	5.967	1.99%	0.45%	

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) KDB865664 was ensured to be applied for probe calibration frequencies greater than or equal to 50MHz of the EUT frequencies.
- 3) The above measured tissue parameters were used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies. The SAR test plots may slightly differ from the table above since the DASY rounds to three significant digits.

4.2 System Check

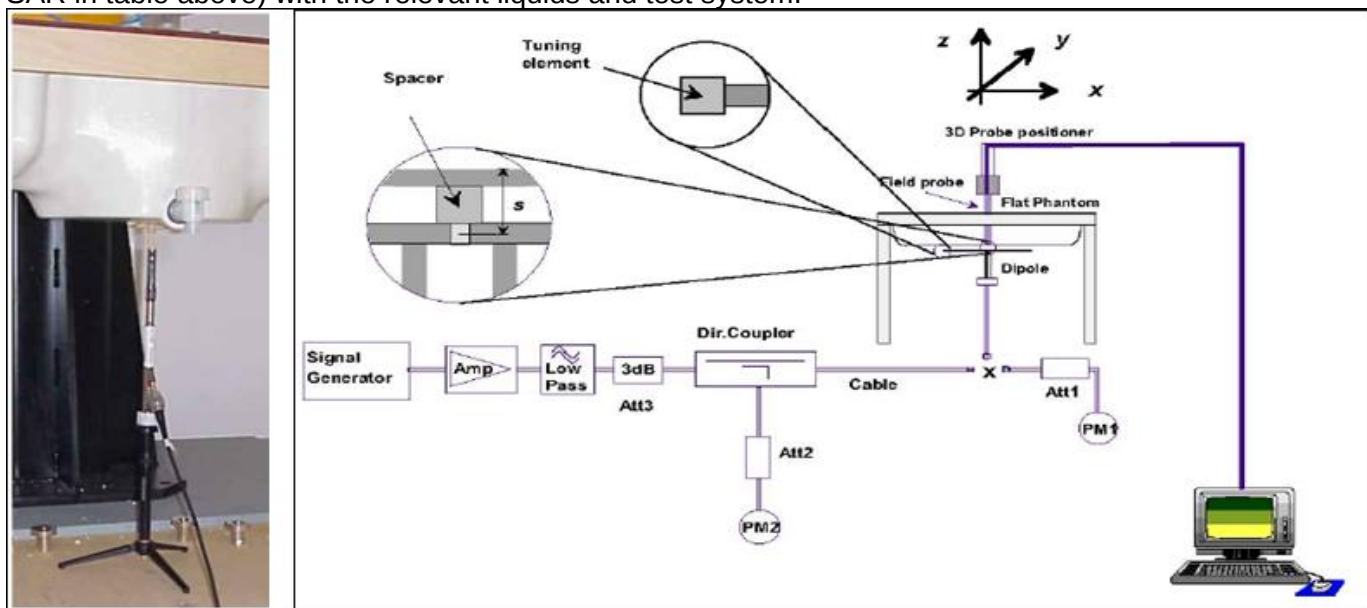
The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system check is performed with tissue equivalent material according to IEEE 1528 (described above). The following table shows system check results for all frequency bands and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

Dipole Information	System Check	Target SAR (Normalized to 1W)		Measured SAR (Normalized to 1W)		Deviation (Within +/-10%)		Test Date
SN		1-g (mW/g)	10-g (mW/g)	1-g (mW/g)	10-g (mW/g)	Δ 1-g	Δ 10-g	
860	2450MHz Body	51.60	24.20	47.60	23.96	-7.75%	-0.99%	2019-2-27
860	2450MHz Body	51.60	24.20	49.60	23.56	-3.88%	-2.64%	2019-3-2
1155	5250MHz Body	74.70	20.90	76.30	21.90	2.14%	4.78%	2019-2-28
1155	5600MHz Body	79.60	22.10	81.90	23.40	2.89%	5.88%	2019-2-28
1155	5750MHz Body	73.30	20.40	74.50	21.20	1.64%	3.92%	2019-2-28

Table 6: System Check Results

4.3 System check Procedure

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



5 SAR measurement variability and uncertainty

5.1 SAR measurement variability

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

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

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

The detailed repeated measurement results are shown in Section 7.2.

5.2 SAR measurement uncertainty

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

6 SAR Test Configuration

6.1 Test Positions Configuration

Per FCC KDB616217D04, The required minimum test separation distance for incorporating transmitters and antennas into laptop, notebook and netbook computer displays is determined with the display screen opened at an angle of 90° to the keyboard compartment. If a computer has other operating configurations that require a different or more conservative display to keyboard angle for normal use, a KDB inquiry should be submitted to determine the test requirements. When antennas are incorporated in the keyboard section of a laptop computer, SAR is required for the bottom surface of the keyboard. Provided tablet use conditions are not supported by the laptop computer, SAR tests for bystander exposure from the edges of the keyboard and display screen of laptop computers are generally not required. However, when edge testing is necessary, the similar concerns for simultaneous transmission on adjacent or multiple edges described for laptop also apply.

For this device, the transmit antennas are located at the keyboard section. Body operating configurations are tested with the device bottom side positioned against a flat phantom with test separation distance of 0mm in a normal use configuration.

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. Per KDB248227 D01, a minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

6.2.1 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 $\leq 0.4 \text{ W/kg}$, 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 $\leq 0.8 \text{ W/kg}$ 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 $> 0.8 \text{ W/kg}$, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the *reported* SAR is $\leq 1.2 \text{ W/kg}$ 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 KDB248227 D01). 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 $> 0.8 \text{ W/kg}$, SAR measurement is required for the subsequent next highest measured output power channel(s) in the initial test configuration until the *reported* SAR is $\leq 1.2 \text{ W/kg}$ 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 KDB248227 D01) 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 KDB248227 D01). 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 a/g/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.

6.2.5 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.

6.2.6 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, the channels at 5.60 – 5.65 GHz in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification to avoid SAR requirements.¹⁰ TDWR restriction does not apply under the new rules; 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.¹¹ 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.

6.2.7 OFDM Transmission Mode SAR Test Channel Selection Requirements

For 2.4 GHz and 5 GHz bands, When the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations (for example 802.11a, 802.11n and 802.11ac, or 802.11g and 802.11n, with the same channel bandwidth, modulation, and data rate, etc), the lower order 802.11 mode (i.e., 802.11a is chosen over 802.11n then 802.11ac, or 802.11g is chosen over 802.11n) is used for SAR measurement. When the maximum output power are the same for multiple test channel, either according to the default or additional power measurement requirement, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

6.2.8 MIMO SAR Considerations

Per KDB248227 D01, simultaneous transmission provisions in KDB Publication 447498 should be used to determine simultaneous transmission SAR test exclusion for WiFi MIMO. If the sum of 1-g SAR single transmission SAR measurement is $<1.6\text{W/kg}$, no additional SAR measurements for MIMO are required. Alternatively, SAR for MIMO can be measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

6.3 Power Reduction Specification

This device uses the following power reduction features to reduce the transmit power and ensure SAR compliance. These power reduction features are implemented using a single fixed level of reduction through static table look-up for some wireless operating modes or frequency bands and triggered by a single event or operation. The published RF exposure KDB procedures are applicable to the specific implementation and applied for testing. So PAG is not required for these features.

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

Antenna	MCC OF CE COUNTRY (CE standard)	MCC OF FCC COUNTRY (FCC standard)
WiFi 2.4G (Main Ant)	Power Level A1	Power Level B1
WiFi 5G (Aux Ant)	Power Level A2	Power Level B2
WiFi 2.4G (Main Ant)	Power Level A3	Power Level B3
WiFi 5G (Aux Ant)	Power Level A4	Power Level B4

6.3.1 Power Level Specification of WiFi Antenna

The following tables summarize the key WiFi power level information and WiFi conducted power validation results of MCC detection mechanism with signaling mode:

Mode	Channel	Max Power Level (dBm)	
		WiFi Antenna	
		MCC OF CE COUNTRY	MCC OF FCC COUNTRY
WiFi 2.4G 802.11b	1CH	16.0	16.0
	11CH	16.0	15.0
	other channels	16.0	17.0
WiFi 2.4G 802.11g	1CH	16.0	16.0
	11CH	16.0	15.0
	other channels	16.0	17.0
WiFi 2.4G 802.11n 20M SISO	1CH	16.0	16.0
	11CH	16.0	15.0
	other channels	16.0	17.0
WiFi 2.4G 802.11n 40M SISO	3CH,9CH	16.0	13.0
	other channels	16.0	15.0
WiFi 2.4G 802.11n 20M MIMO	1CH	13.0	13.0
	11CH	13.0	12.0
	other channels	13.0	14.0
WiFi 2.4G 802.11n 40M MIMO	3CH,9CH	13.0	10.0
	other channels	13.0	12.0

Mode	Channel	Max Power Level (dBm)			
		WiFi Antenna			
		MCC OF CE COUNTRY		MCC OF FCC COUNTRY	
		MAIN	AUX	MAIN	AUX
WiFi 5G 802.11a	149-165CH	10.5	11.0	10.5	11.0
	other channels	16.5	16.5	10.5	11.0
WiFi 5G 802.11n 20M SISO	149-165CH	10.5	11.0	10.5	11.0
	other channels	16.5	16.5	10.5	11.0
WiFi 5G 802.11n 40M SISO	151-159CH	10.5	11.0	10.5	11.0
	other channels	14.5	15.5	10.5	11.0
WiFi 5G 802.11n 20M MIMO	149-165CH	8.0	8.0	8.0	8.0
	other channels	13.5	13.5	8.0	8.0
WiFi 5G 802.11n 40M MIMO	151-159CH	8.0	8.0	8.0	8.0
	other channels	12.0	12.0	8.0	8.0
WiFi 5G 802.11ac 20M SISO	149-165CH	10.5	11.0	10.5	11.0
	other channels	16.5	16.5	10.5	11.0
WiFi 5G 802.11ac 40M SISO	151-159CH	10.5	11.0	10.5	11.0
	other channels	14.5	15.5	10.5	11.0
WiFi 5G 802.11ac 80M SISO	155CH	10.5	11.0	10.5	11.0
	other channels	14.5	15.5	10.5	11.0
802.11ac 160M SISO	50CH,114CH	14.5	15.5	10.5	11.0
WiFi 5G 802.11ac 20M MIMO	149-165CH	8.0	8.0	8.0	8.0
	other channels	13.5	13.5	8.0	8.0
WiFi 5G 802.11ac 40M MIMO	151-159CH	8.0	8.0	8.0	8.0
	other channels	12.0	12.0	8.0	8.0
WiFi 5G 802.11ac 80M MIMO	155CH	8.0	8.0	8.0	8.0
	other channels	12.0	12.0	8.0	8.0
802.11ac 160M MIMO	50CH,114CH	12.0	12.0	8.0	8.0

Note:

- 1)For FCC SAR test, WiFi SAR test should be evaluated at the power level of FCC mobile country code for each exposure conditions.
- 2)The detailed full power and reduced conducted power measurement results are provided in section 7.1 of this report

7 SAR Measurement Results

7.1 Conducted power measurements

For the measurements, Radio Communication Tester was used.

7.1.1 Conducted power of WiFi 2.4G

Mode	Ant	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up Max.	Average Power (dBm)	SAR Test (Yes/No)
802.11b	Main	1	2412	1Mbps	16.00	14.69	No
		2	2417		17.00	15.71	Yes
		6	2437		17.00	15.75	Yes
		10	2457		17.00	15.87	Yes
		11	2462		15.00	14.01	No
	Aux	1	2412	1Mbps	16.00	14.41	No
		2	2417		17.00	15.50	Yes
		6	2437		17.00	15.52	Yes
		10	2457		17.00	15.60	Yes
		11	2462		15.00	13.68	No
802.11g	Main	1	2412	6Mbps	16.00	14.80	No
		2	2417		17.00	15.69	No
		6	2437		17.00	15.75	No
		10	2457		17.00	15.79	No
		11	2462		15.00	13.92	No
	Aux	1	2412	6Mbps	16.00	14.54	No
		2	2417		17.00	15.42	No
		6	2437		17.00	15.43	No
		10	2457		17.00	15.52	No
		11	2462		15.00	13.70	No
802.11n SISO 20M	Main	1	2412	MCS0	16.00	14.72	No
		2	2417		17.00	15.55	No
		6	2437		17.00	15.65	No
		10	2457		17.00	15.69	No
		11	2462		15.00	13.79	No
	Aux	1	2412	MCS0	16.00	14.35	No
		2	2417		17.00	15.31	No
		6	2437		17.00	15.32	No
		10	2457		17.00	15.41	No
		11	2462		15.00	13.63	No
802.11n SISO 40M	Main	3	2422	MCS0	13.00	11.78	No
		4	2427		15.00	13.52	No
		6	2437		15.00	13.72	No
		8	2437		15.00	13.61	No
		9	2452		13.00	11.82	No
	Aux	3	2422	MCS0	13.00	11.47	No
		4	2427		15.00	13.25	No
		6	2437		15.00	13.35	No
		8	2437		15.00	13.33	No
		9	2452		13.00	11.33	No

Mode	Ant	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up Max.	Average Power (dBm)	SAR Test (Yes/No)
802.11n MIMO 20M	Main	1	2412	MCS8	13.00	11.75	No
		2	2417		14.00	12.66	No
		6	2437		14.00	12.82	No
		10	2457		14.00	12.85	No
		11	2462		12.00	10.94	No
	Aux	1	2412	MCS8	13.00	11.39	No
		2	2417		14.00	12.25	No
		6	2437		14.00	12.28	No
		10	2457		14.00	12.46	No
		11	2462		12.00	10.49	No
	Sum	1	2412	MCS8	16.00	14.58	No
		2	2417		17.00	15.47	Yes
		6	2437		17.00	15.57	Yes
		10	2457		17.00	15.67	Yes
		11	2462		15.00	13.73	No
802.11n MIMO 40M	Main	3	2422	MCS8	10.00	8.89	No
		4	2427		12.00	10.68	No
		6	2437		12.00	10.92	No
		8	2437		12.00	10.72	No
		9	2452		10.00	8.93	No
	Aux	3	2422	MCS8	10.00	8.54	No
		4	2427		12.00	10.11	No
		6	2437		12.00	10.31	No
		8	2437		12.00	10.25	No
		9	2452		10.00	8.47	No
	Sum	3	2422	MCS8	13.00	11.73	No
		4	2427		15.00	13.41	No
		6	2437		15.00	13.64	No
		8	2437		15.00	13.50	No
		9	2452		13.00	11.72	No

Table 7: Conducted power measurement results of WiFi 2.4G(MCC of FCC countries)

Note:

1) The bolded mode was selected for SAR testing.

Mode	Ant	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11b	Main	1	2412	1Mbps	16.00	14.89	No
		2	2417		16.00	14.88	No
		6	2437		16.00	14.90	No
		10	2457		16.00	14.93	No
		11	2462		16.00	14.69	No
	Aux	1	2412	1Mbps	16.00	14.64	No
		2	2417		16.00	14.66	No
		6	2437		16.00	14.72	No
		10	2457		16.00	14.74	No
		11	2462		16.00	14.58	No
802.11g	Main	1	2412	6Mbps	16.00	14.71	No
		2	2417		16.00	14.80	No
		6	2437		16.00	14.91	No
		10	2457		16.00	14.87	No
		11	2462		16.00	14.95	No
	Aux	1	2412	6Mbps	16.00	14.47	No
		2	2417		16.00	14.52	No
		6	2437		16.00	14.63	No
		10	2457		16.00	14.57	No
		11	2462		16.00	14.74	No
802.11n SISO 20M	Main	1	2412	MCS0	16.00	14.68	No
		2	2417		16.00	14.73	No
		6	2437		16.00	14.80	No
		10	2457		16.00	14.64	No
		11	2462		16.00	14.79	No
	Aux	1	2412	MCS0	16.00	14.47	No
		2	2417		16.00	14.54	No
		6	2437		16.00	14.63	No
		10	2457		16.00	14.45	No
		11	2462		16.00	14.53	No
802.11n SISO 40M	Main	3	2422	MCS0	16.00	14.67	No
		4	2427		16.00	14.55	No
		6	2437		16.00	14.32	No
		8	2437		16.00	14.43	No
		9	2452		16.00	14.65	No
	Aux	3	2422	MCS0	16.00	14.41	No
		4	2427		16.00	14.33	No
		6	2437		16.00	14.49	No
		8	2437		16.00	14.39	No
		9	2452		16.00	14.57	No
Mode	Ant	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11n MIMO 20M	Main	1	2412	MCS8	13.00	11.86	No
		2	2417		13.00	11.84	No
		6	2437		13.00	11.88	No
		10	2457		13.00	11.90	No
		11	2462		13.00	11.65	No
	Aux	1	2412	MCS8	13.00	11.50	No
		2	2417		13.00	11.54	No
		6	2437		13.00	11.69	No
		10	2457		13.00	11.78	No
		11	2462		13.00	11.41	No

	Sum	1	2412	MCS8	16.00	14.69	No
		2	2417		16.00	14.70	No
		6	2437		16.00	14.80	No
		10	2457		16.00	14.85	No
		11	2462		16.00	14.54	No
802.11n MIMO 40M	Main	3	2422	MCS8	13.00	11.65	No
		4	2427		13.00	11.73	No
		6	2437		13.00	11.68	No
		8	2437		13.00	11.59	No
		9	2452		13.00	11.80	No
	Aux	3	2422	MCS8	13.00	11.42	No
		4	2427		13.00	11.61	No
		6	2437		13.00	11.52	No
		8	2437		13.00	11.48	No
		9	2452		13.00	11.72	No
	Sum	3	2422	MCS8	16.00	14.55	No
		4	2427		16.00	14.68	No
		6	2437		16.00	14.61	No
		8	2437		16.00	14.55	No
		9	2452		16.00	14.77	No

Table 8: Test results conducted power measurement WiFi 2.4G(MCC of CE countries)

7.1.2 Conducted power of WiFi 5G

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11a	Main	CH 36	5180	6Mbps	10.50	9.20	No
		CH 40	5200		10.50	9.15	No
		CH 44	5220		10.50	9.22	No
		CH 48	5240		10.50	9.05	No
		CH 52	5260		10.50	9.10	No
		CH 56	5280		10.50	9.15	No
		CH 60	5300		10.50	9.07	No
		CH 64	5320		10.50	9.03	No
		CH 100	5500		10.50	8.75	No
		CH 104	5520		10.50	8.85	No
		CH 108	5540		10.50	8.99	No
		CH 112	5560		10.50	9.00	No
		CH 116	5580		10.50	8.91	No
		CH 120	5600		10.50	9.05	No
		CH 124	5620		10.50	9.13	No
		CH 128	5640		10.50	9.18	No
		CH 132	5660		10.50	9.05	No
		CH 136	5680		10.50	9.21	No
		CH 140	5700		10.50	8.98	No
		CH 149	5745		10.50	9.14	No
		CH 153	5765		10.50	9.20	No
		CH 157	5785		10.50	9.06	No
		CH 161	5805		10.50	9.18	No
		CH 165	5825		10.50	9.05	No
	Aux	CH 36	5180	6Mbps	11.00	9.98	No
		CH 40	5200		11.00	10.30	No
		CH 44	5220		11.00	10.09	No
		CH 48	5240		11.00	10.18	No
		CH 52	5260		11.00	10.19	No
		CH 56	5280		11.00	10.38	No
		CH 60	5300		11.00	10.10	No
		CH 64	5320		11.00	9.79	No
		CH 100	5500		11.00	9.77	No
		CH 104	5520		11.00	9.92	No
		CH 108	5540		11.00	9.69	No
		CH 112	5560		11.00	9.85	No
		CH 116	5580		11.00	9.59	No
		CH 120	5600		11.00	9.91	No
		CH 124	5620		11.00	10.17	No
		CH 128	5640		11.00	9.81	No
		CH 132	5660		11.00	9.86	No
		CH 136	5680		11.00	10.02	No
		CH 140	5700		11.00	10.16	No
		CH 149	5745		11.00	10.07	No
		CH 153	5765		11.00	10.19	No
		CH 157	5785		11.00	10.30	No
		CH 161	5805		11.00	10.25	No
		CH 165	5825		11.00	10.27	No

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11n SISO 20M (5GHz)	Main	CH 36	5180	MCS0	10.50	9.20	No
		CH 40	5200		10.50	9.00	No
		CH 44	5220		10.50	9.12	No
		CH 48	5240		10.50	9.07	No
		CH 52	5260		10.50	9.19	No
		CH 56	5280		10.50	9.06	No
		CH 60	5300		10.50	8.90	No
		CH 64	5320		10.50	8.92	No
		CH 100	5500		10.50	8.77	No
		CH 104	5520		10.50	8.71	No
		CH 108	5540		10.50	8.87	No
		CH 112	5560		10.50	8.82	No
		CH 116	5580		10.50	8.84	No
		CH 120	5600		10.50	8.98	No
		CH 124	5620		10.50	9.06	No
		CH 128	5640		10.50	9.08	No
		CH 132	5660		10.50	8.95	No
		CH 136	5680		10.50	9.10	No
		CH 140	5700		10.50	8.91	No
		CH 149	5745		10.50	8.98	No
		CH 153	5765		10.50	9.14	No
		CH 157	5785		10.50	8.97	No
		CH 161	5805		10.50	9.09	No
		CH 165	5825		10.50	8.97	No
	Aux	CH 36	5180	MCS0	11.00	10.12	No
		CH 40	5200		11.00	10.20	No
		CH 44	5220		11.00	9.90	No
		CH 48	5240		11.00	10.10	No
		CH 52	5260		11.00	9.99	No
		CH 56	5280		11.00	10.21	No
		CH 60	5300		11.00	10.07	No
		CH 64	5320		11.00	9.59	No
		CH 100	5500		11.00	9.43	No
		CH 104	5520		11.00	9.56	No
		CH 108	5540		11.00	9.50	No
		CH 112	5560		11.00	9.55	No
		CH 116	5580		11.00	9.64	No
		CH 120	5600		11.00	9.74	No
		CH 124	5620		11.00	9.98	No
		CH 128	5640		11.00	9.85	No
		CH 132	5660		11.00	10.01	No
		CH 136	5680		11.00	10.02	No
		CH 140	5700		11.00	10.12	No
		CH 149	5745		11.00	9.94	No
		CH 153	5765		11.00	10.23	No
		CH 157	5785		11.00	10.35	No
		CH 161	5805		11.00	10.13	No
		CH 165	5825		11.00	10.17	No

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11n SISO 40M (5GHz)	Main	CH 38	5190	MCS0	10.50	9.18	No
		CH 46	5230		10.50	9.08	No
		CH 54	5270		10.50	9.05	No
		CH 62	5310		10.50	8.93	No
		CH 102	5510		10.50	8.80	No
		CH 110	5550		10.50	8.87	No
		CH 118	5590		10.50	9.02	No
		CH 126	5630		10.50	9.19	No
		CH 134	5670		10.50	9.17	No
		CH 151	5755		10.50	9.24	No
		CH 159	5795		10.50	9.11	No
	Aux	CH 38	5190	MCS0	11.00	10.33	No
		CH 46	5230		11.00	9.96	No
		CH 54	5270		11.00	10.21	No
		CH 62	5310		11.00	9.78	No
		CH 102	5510		11.00	9.56	No
		CH 110	5550		11.00	9.54	No
		CH 118	5590		11.00	9.64	No
		CH 126	5630		11.00	9.87	No
		CH 134	5670		11.00	9.95	No
		CH 151	5755		11.00	10.00	No
		CH 159	5795		11.00	10.11	No
Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11ac SISO 20M (5GHz)	Main	CH 36	5180	MCS0	10.50	9.22	No
		CH 40	5200		10.50	9.26	No
		CH 44	5220		10.50	9.31	No
		CH 48	5240		10.50	9.11	No
		CH 52	5260		10.50	9.26	No
		CH 56	5280		10.50	9.22	No
		CH 60	5300		10.50	9.15	No
		CH 64	5320		10.50	9.13	No
		CH 100	5500		10.50	8.84	No
		CH 104	5520		10.50	8.91	No
		CH 108	5540		10.50	9.02	No
		CH 112	5560		10.50	9.09	No
		CH 116	5580		10.50	9.10	No
		CH 120	5600		10.50	9.21	No
		CH 124	5620		10.50	9.15	No
		CH 128	5640		10.50	9.18	No
		CH 132	5660		10.50	9.15	No
		CH 136	5680		10.50	9.28	No
		CH 140	5700		10.50	9.12	No
		CH 149	5745		10.50	9.22	No
		CH 153	5765		10.50	9.35	No
		CH 157	5785		10.50	9.17	No
		CH 161	5805		10.50	9.28	No
		CH 165	5825		10.50	9.16	No
	Aux	CH 36	5180	MCS0	11.00	10.09	No
		CH 40	5200		11.00	10.22	No
		CH 44	5220		11.00	9.89	No
		CH 48	5240		11.00	10.10	No

		CH 52	5260		11.00	9.97	No
		CH 56	5280		11.00	10.19	No
		CH 60	5300		11.00	10.07	No
		CH 64	5320		11.00	9.60	No
		CH 100	5500		11.00	9.44	No
		CH 104	5520		11.00	9.58	No
		CH 108	5540		11.00	9.50	No
		CH 112	5560		11.00	9.54	No
		CH 116	5580		11.00	9.63	No
		CH 120	5600		11.00	9.76	No
		CH 124	5620		11.00	10.04	No
		CH 128	5640		11.00	9.84	No
		CH 132	5660		11.00	9.86	No
		CH 136	5680		11.00	10.01	No
		CH 140	5700		11.00	10.16	No
		CH 149	5745		11.00	9.87	No
		CH 153	5765		11.00	10.20	No
		CH 157	5785		11.00	10.19	No
		CH 161	5805		11.00	10.10	No
		CH 165	5825		11.00	10.30	No
Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11ac SISO 40M (5GHz)	Main	CH 38	5190	MCS0	10.50	9.32	No
		CH 46	5230		10.50	9.22	No
		CH 54	5270		10.50	9.18	No
		CH 62	5310		10.50	9.00	No
		CH 102	5510		10.50	8.97	No
		CH 110	5550		10.50	9.02	No
		CH 118	5590		10.50	9.02	No
		CH 126	5630		10.50	9.15	No
		CH 134	5670		10.50	9.18	No
		CH 151	5755		10.50	9.23	No
		CH 159	5795		10.50	9.19	No
	Aux	CH 38	5190	MCS0	11.00	10.18	No
		CH 46	5230		11.00	10.06	No
		CH 54	5270		11.00	10.14	No
		CH 62	5310		11.00	9.76	No
		CH 102	5510		11.00	9.74	No
		CH 110	5550		11.00	9.68	No
		CH 118	5590		11.00	9.78	No
		CH 126	5630		11.00	10.10	No
		CH 134	5670		11.00	10.08	No
		CH 151	5755		11.00	10.10	No
		CH 159	5795		11.00	10.28	No

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11ac SISO 80M (5GHz)	Main	CH 42	5210	MCS0	10.50	9.02	No
		CH 58	5290		10.50	8.97	Yes
		CH 106	5530		10.50	8.74	No
		CH 122	5610		10.50	8.98	No
		CH 155	5775		10.50	9.35	Yes
	Aux	CH 42	5210	MCS0	11.00	9.93	No
		CH 58	5290		11.00	9.88	Yes
		CH 106	5530		11.00	9.39	No
		CH 122	5610		11.00	9.77	No
		CH 155	5775		11.00	10.04	Yes
Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11ac SISO 160M (5GHz)	Main	CH 50	5250	MCS0	10.50	8.80	No
		CH 114	5570		10.50	8.75	Yes
	Aux	CH 50	5250	MCS0	11.00	9.79	No
		CH 114	5570		11.00	9.25	Yes
Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11n MIMO 20M (5GHz)	Main	CH 36	5180	MCS8	8.00	7.12	No
		CH 40	5200		8.00	7.05	No
		CH 44	5220		8.00	7.12	No
		CH 48	5240		8.00	7.05	No
		CH 52	5260		8.00	7.22	No
		CH 56	5280		8.00	7.02	No
		CH 60	5300		8.00	7.11	No
		CH 64	5320		8.00	7.01	No
		CH 100	5500		8.00	6.98	No
		CH 104	5520		8.00	6.94	No
		CH 108	5540		8.00	7.02	No
		CH 112	5560		8.00	7.10	No
		CH 116	5580		8.00	7.04	No
		CH 120	5600		8.00	6.88	No
		CH 124	5620		8.00	7.24	No
		CH 128	5640		8.00	7.18	No
		CH 132	5660		8.00	6.99	No
		CH 136	5680		8.00	7.00	No
		CH 140	5700		8.00	7.06	No
		CH 149	5745		8.00	7.05	No
		CH 153	5765		8.00	7.20	No
		CH 157	5785		8.00	7.06	No
		CH 161	5805		8.00	7.14	No
		CH 165	5825		8.00	7.18	No
	Aux	CH 36	5180	MCS8	8.00	7.02	No
		CH 40	5200		8.00	6.98	No
		CH 44	5220		8.00	7.05	No
		CH 48	5240		8.00	7.11	No
		CH 52	5260		8.00	7.10	No
		CH 56	5280		8.00	7.06	No
		CH 60	5300		8.00	7.08	No
		CH 64	5320		8.00	6.99	No
		CH 100	5500		8.00	6.94	No
		CH 104	5520		8.00	7.02	No

		CH 108	5540		8.00	7.01	No
		CH 112	5560		8.00	7.00	No
		CH 116	5580		8.00	6.97	No
		CH 120	5600		8.00	7.11	No
		CH 124	5620		8.00	7.09	No
		CH 128	5640		8.00	7.10	No
		CH 132	5660		8.00	7.13	No
		CH 136	5680		8.00	7.05	No
		CH 140	5700		8.00	6.98	No
		CH 149	5745		8.00	7.11	No
		CH 153	5765		8.00	7.08	No
		CH 157	5785		8.00	7.14	No
		CH 161	5805		8.00	7.20	No
		CH 165	5825		8.00	7.18	No
	Sum	CH 36	5180	MCS8	11.00	10.08	No
		CH 40	5200		11.00	10.03	No
		CH 44	5220		11.00	10.10	No
		CH 48	5240		11.00	10.09	No
		CH 52	5260		11.00	10.17	No
		CH 56	5280		11.00	10.05	No
		CH 60	5300		11.00	10.11	No
		CH 64	5320		11.00	10.01	No
		CH 100	5500		11.00	9.97	No
		CH 104	5520		11.00	9.99	No
		CH 108	5540		11.00	10.03	No
		CH 112	5560		11.00	10.06	No
		CH 116	5580		11.00	10.02	No
		CH 120	5600		11.00	10.01	No
		CH 124	5620		11.00	10.18	No
		CH 128	5640		11.00	10.15	No
		CH 132	5660		11.00	10.07	No
		CH 136	5680		11.00	10.04	No
		CH 140	5700		11.00	10.03	No
		CH 149	5745		11.00	10.09	No
		CH 153	5765		11.00	10.15	No
		CH 157	5785		11.00	10.11	No
		CH 161	5805		11.00	10.18	No
		CH 165	5825		11.00	10.19	No

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11n MIMO 40M (5GHz)	Main	CH 38	5190	MCS8	8.00	7.11	No
		CH 46	5230		8.00	6.98	No
		CH 54	5270		8.00	6.95	No
		CH 62	5310		8.00	7.02	No
		CH 102	5510		8.00	6.95	No
		CH 110	5550		8.00	7.10	No
		CH 118	5590		8.00	7.05	No
		CH 126	5630		8.00	7.01	No
		CH 134	5670		8.00	7.00	No
		CH 151	5755		8.00	6.99	No
		CH 159	5795		8.00	6.94	No
	Aux	CH 38	5190	MCS8	8.00	7.05	No
		CH 46	5230		8.00	7.01	No
		CH 54	5270		8.00	6.92	No
		CH 62	5310		8.00	6.90	No
		CH 102	5510		8.00	7.11	No
		CH 110	5550		8.00	7.08	No
		CH 118	5590		8.00	7.02	No
		CH 126	5630		8.00	6.99	No
		CH 134	5670		8.00	7.01	No
		CH 151	5755		8.00	7.10	No
		CH 159	5795		8.00	7.12	No
	Sum	CH 38	5190	MCS8	11.00	10.09	No
		CH 46	5230		11.00	10.01	No
		CH 54	5270		11.00	9.95	No
		CH 62	5310		11.00	9.97	No
		CH 102	5510		11.00	10.04	No
		CH 110	5550		11.00	10.10	No
		CH 118	5590		11.00	10.05	No
		CH 126	5630		11.00	10.01	No
		CH 134	5670		11.00	10.02	No
		CH 151	5755		11.00	10.06	No
		CH 159	5795		11.00	10.04	No
Mode	Antenna	Channel	Frequency(MHz)	Data Rate (Mbps)	Tune-up	Average Power(dBm)	SAR Test(Yes/No)
802.11ac MIMO 20M (5GHz)	Main	CH 36	5180	MCS0	8.00	7.09	No
		CH 40	5200		8.00	7.02	No
		CH 44	5220		8.00	7.09	No
		CH 48	5240		8.00	7.02	No
		CH 52	5260		8.00	7.19	No
		CH 56	5280		8.00	6.99	No
		CH 60	5300		8.00	7.08	No
		CH 64	5320		8.00	6.98	No
		CH 100	5500		8.00	6.95	No
		CH 104	5520		8.00	6.91	No
		CH 108	5540		8.00	6.99	No
		CH 112	5560		8.00	7.07	No
		CH 116	5580		8.00	7.01	No
		CH 120	5600		8.00	6.85	No
		CH 124	5620		8.00	7.21	No
		CH 128	5640		8.00	7.15	No
		CH 132	5660		8.00	6.96	No

		CH 136	5680		8.00	6.97	No
		CH 140	5700		8.00	7.03	No
		CH 149	5745		8.00	7.02	No
		CH 153	5765		8.00	7.17	No
		CH 157	5785		8.00	7.03	No
		CH 161	5805		8.00	7.11	No
		CH 165	5825		8.00	7.15	No
	Aux	CH 36	5180	MCS0	8.00	6.99	No
		CH 40	5200		8.00	6.95	No
		CH 44	5220		8.00	7.02	No
		CH 48	5240		8.00	7.08	No
		CH 52	5260		8.00	7.07	No
		CH 56	5280		8.00	7.03	No
		CH 60	5300		8.00	7.05	No
		CH 64	5320		8.00	6.96	No
		CH 100	5500		8.00	6.91	No
		CH 104	5520		8.00	6.99	No
		CH 108	5540		8.00	6.98	No
		CH 112	5560		8.00	6.97	No
		CH 116	5580		8.00	6.94	No
		CH 120	5600		8.00	7.08	No
		CH 124	5620		8.00	7.06	No
		CH 128	5640		8.00	7.07	No
		CH 132	5660		8.00	7.10	No
		CH 136	5680		8.00	7.02	No
		CH 140	5700		8.00	6.95	No
		CH 149	5745		8.00	7.08	No
		CH 153	5765		8.00	7.05	No
		CH 157	5785		8.00	7.11	No
		CH 161	5805		8.00	7.17	No
		CH 165	5825		8.00	7.15	No
	Sum	CH 36	5180	MCS0	11.00	10.05	No
		CH 40	5200		11.00	10.00	No
		CH 44	5220		11.00	10.07	No
		CH 48	5240		11.00	10.06	No
		CH 52	5260		11.00	10.14	No
		CH 56	5280		11.00	10.02	No
		CH 60	5300		11.00	10.08	No
		CH 64	5320		11.00	9.98	No
		CH 100	5500		11.00	9.94	No
		CH 104	5520		11.00	9.96	No
		CH 108	5540		11.00	10.00	No
		CH 112	5560		11.00	10.03	No
		CH 116	5580		11.00	9.99	No
		CH 120	5600		11.00	9.98	No
		CH 124	5620		11.00	10.15	No
		CH 128	5640		11.00	10.12	No
		CH 132	5660		11.00	10.04	No
		CH 136	5680		11.00	10.01	No
		CH 140	5700		11.00	10.00	No
		CH 149	5745		11.00	10.06	No
		CH 153	5765		11.00	10.12	No
		CH 157	5785		11.00	10.08	No
		CH 161	5805		11.00	10.15	No
		CH 165	5825		11.00	10.16	No

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11ac MIMO 40M (5GHz)	Main	CH 38	5190	MCS0	8.00	7.13	No
		CH 46	5230		8.00	7.00	No
		CH 54	5270		8.00	6.97	No
		CH 62	5310		8.00	7.04	No
		CH 102	5510		8.00	6.97	No
		CH 110	5550		8.00	7.12	No
		CH 118	5590		8.00	7.07	No
		CH 126	5630		8.00	7.03	No
		CH 134	5670		8.00	7.02	No
		CH 151	5755		8.00	7.01	No
		CH 159	5795		8.00	6.96	No
	Aux	CH 38	5190	MCS0	8.00	7.07	No
		CH 46	5230		8.00	7.03	No
		CH 54	5270		8.00	6.94	No
		CH 62	5310		8.00	6.92	No
		CH 102	5510		8.00	7.13	No
		CH 110	5550		8.00	7.10	No
		CH 118	5590		8.00	7.04	No
		CH 126	5630		8.00	7.01	No
		CH 134	5670		8.00	7.03	No
		CH 151	5755		8.00	7.12	No
		CH 159	5795		8.00	7.14	No
	Sum	CH 38	5190	MCS0	11.00	10.11	No
		CH 46	5230		11.00	10.03	No
		CH 54	5270		11.00	9.97	No
		CH 62	5310		11.00	9.99	No
		CH 102	5510		11.00	10.06	No
		CH 110	5550		11.00	10.12	No
		CH 118	5590		11.00	10.07	No
		CH 126	5630		11.00	10.03	No
		CH 134	5670		11.00	10.04	No
		CH 151	5755		11.00	10.08	No
		CH 159	5795		11.00	10.06	No
Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11ac MIMO 80M (5GHz)	Main	CH 42	5210	MCS0	8.00	6.95	No
		CH 58	5290		8.00	7.01	No
		CH 106	5530		8.00	6.94	No
		CH 122	5610		8.00	6.88	No
		CH 155	5775		8.00	7.05	No
	Aux	CH 42	5210	MCS0	8.00	7.12	No
		CH 58	5290		8.00	7.04	No
		CH 106	5530		8.00	7.10	No
		CH 122	5610		8.00	7.18	No
		CH 155	5775		8.00	7.22	No
	Sum	CH 42	5210	MCS0	11.00	10.05	No
		CH 58	5290		11.00	10.04	Yes
		CH 106	5530		11.00	10.03	No
		CH 122	5610		11.00	10.04	No
		CH 155	5775		11.00	10.15	Yes

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11ac MIMO 160 (5GHz)	Main	CH 50	5250	MCS0	8.00	7.03	No
		CH 114	5570		8.00	7.14	No
	Aux	CH 50	5250	MCS0	8.00	6.99	No
		CH 114	5570		8.00	7.05	No
	Sum	CH 50	5250	MCS0	11.00	10.02	No
		CH 114	5570		11.00	10.11	Yes

Table 9: Conducted power measurement results of WiFi 5G(MCC of FCC countries)

Note:

1) The bolded mode was selected for SAR testing.

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11a SISO	Main	CH 36	5180	6Mbps	16.50	15.28	No
		CH 40	5200		16.50	15.33	No
		CH 44	5220		16.50	15.41	No
		CH 48	5240		16.50	15.27	No
		CH 52	5260		16.50	15.22	No
		CH 56	5280		16.50	15.23	No
		CH 60	5300		16.50	15.19	No
		CH 64	5320		16.50	15.10	No
		CH 100	5500		16.50	14.91	No
		CH 104	5520		16.50	14.98	No
		CH 108	5540		16.50	15.24	No
		CH 112	5560		16.50	15.31	No
		CH 116	5580		16.50	15.05	No
		CH 120	5600		16.50	15.26	No
		CH 124	5620		16.50	15.45	No
		CH 128	5640		16.50	14.95	No
		CH 132	5660		16.50	14.87	No
		CH 136	5680		16.50	15.07	No
		CH 140	5700		16.50	15.28	No
		CH 149	5745		10.50	9.43	No
		CH 153	5765		10.50	9.33	No
		CH 157	5785		10.50	9.28	No
		CH 161	5805		10.50	9.40	No
		CH 165	5825		10.50	9.31	No
	Aux	CH 36	5180	6Mbps	16.50	15.40	No
		CH 40	5200		16.50	15.47	No
		CH 44	5220		16.50	15.31	No
		CH 48	5240		16.50	15.05	No
		CH 52	5260		16.50	15.27	No
		CH 56	5280		16.50	14.99	No
		CH 60	5300		16.50	15.10	No
		CH 64	5320		16.50	14.92	No
		CH 100	5500		16.50	15.02	No
		CH 104	5520		16.50	15.23	No
		CH 108	5540		16.50	15.49	No
		CH 112	5560		16.50	15.31	No
		CH 116	5580		16.50	15.22	No
		CH 120	5600		16.50	15.44	No
		CH 124	5620		16.50	15.36	No
		CH 128	5640		16.50	14.89	No
		CH 132	5660		16.50	15.11	No
		CH 136	5680		16.50	15.34	No
		CH 140	5700		16.50	15.77	No
		CH 149	5745		11.00	10.23	No
		CH 153	5765		11.00	10.19	No
		CH 157	5785		11.00	10.33	No
		CH 161	5805		11.00	10.40	No
		CH 165	5825		11.00	10.25	No

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11n SISO 20M (5GHz)	Main	CH 36	5180	MCS0	16.50	15.15	No
		CH 40	5200		16.50	15.23	No
		CH 44	5220		16.50	15.09	No
		CH 48	5240		16.50	14.99	No
		CH 52	5260		16.50	15.11	No
		CH 56	5280		16.50	15.08	No
		CH 60	5300		16.50	15.31	No
		CH 64	5320		16.50	14.96	No
		CH 100	5500		16.50	14.80	No
		CH 104	5520		16.50	15.25	No
		CH 108	5540		16.50	15.19	No
		CH 112	5560		16.50	15.07	No
		CH 116	5580		16.50	14.87	No
		CH 120	5600		16.50	15.26	No
		CH 124	5620		16.50	15.16	No
		CH 128	5640		16.50	15.31	No
		CH 132	5660		16.50	15.02	No
		CH 136	5680		16.50	15.31	No
		CH 140	5700		16.50	15.09	No
		CH 149	5745		10.50	9.40	No
		CH 153	5765		10.50	9.37	No
		CH 157	5785		10.50	9.30	No
		CH 161	5805		10.50	9.25	No
		CH 165	5825		10.50	9.32	No
	Aux	CH 36	5180	MCS0	16.50	15.41	No
		CH 40	5200		16.50	15.37	No
		CH 44	5220		16.50	15.22	No
		CH 48	5240		16.50	15.19	No
		CH 52	5260		16.50	15.28	No
		CH 56	5280		16.50	14.92	No
		CH 60	5300		16.50	15.33	No
		CH 64	5320		16.50	14.88	No
		CH 100	5500		16.50	14.98	No
		CH 104	5520		16.50	15.50	No
		CH 108	5540		16.50	15.49	No
		CH 112	5560		16.50	15.24	No
		CH 116	5580		16.50	15.34	No
		CH 120	5600		16.50	15.48	No
		CH 124	5620		16.50	14.92	No
		CH 128	5640		16.50	14.85	No
		CH 132	5660		16.50	15.40	No
		CH 136	5680		16.50	15.52	No
		CH 140	5700		16.50	15.88	No
		CH 149	5745		11.00	10.15	No
		CH 153	5765		11.00	10.27	No
		CH 157	5785		11.00	10.25	No
		CH 161	5805		11.00	10.15	No
		CH 165	5825		11.00	10.16	No

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11n SISO 40M (5GHz)	Main	CH 38	5190	MCS0	14.50	13.45	No
		CH 46	5230		14.50	13.30	No
		CH 54	5270		14.50	13.25	No
		CH 62	5310		14.50	13.11	No
		CH 102	5510		14.50	13.09	No
		CH 110	5550		14.50	13.12	No
		CH 118	5590		14.50	13.34	No
		CH 126	5630		14.50	13.20	No
		CH 134	5670		14.50	13.38	No
		CH 151	5755		10.50	9.23	No
		CH 159	5795		10.50	9.17	No
	Aux	CH 38	5190	MCS0	15.50	14.84	No
		CH 46	5230		15.50	14.77	No
		CH 54	5270		15.50	14.63	No
		CH 62	5310		15.50	14.36	No
		CH 102	5510		15.50	14.31	No
		CH 110	5550		15.50	14.48	No
		CH 118	5590		15.50	14.53	No
		CH 126	5630		15.50	14.69	No
		CH 134	5670		15.50	14.83	No
		CH 151	5755		11.00	10.11	No
		CH 159	5795		11.00	10.27	No
Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11ac SISO 20M (5GHz)	Main	CH 36	5180	MCS0	16.50	15.26	No
		CH 40	5200		16.50	15.13	No
		CH 44	5220		16.50	15.20	No
		CH 48	5240		16.50	15.35	No
		CH 52	5260		16.50	15.24	No
		CH 56	5280		16.50	15.37	No
		CH 60	5300		16.50	15.19	No
		CH 64	5320		16.50	15.07	No
		CH 100	5500		16.50	14.88	No
		CH 104	5520		16.50	14.92	No
		CH 108	5540		16.50	15.05	No
		CH 112	5560		16.50	15.10	No
		CH 116	5580		16.50	15.34	No
		CH 120	5600		16.50	15.29	No
		CH 124	5620		16.50	15.09	No
		CH 128	5640		16.50	15.40	No
		CH 132	5660		16.50	15.36	No
		CH 136	5680		16.50	15.22	No
		CH 140	5700		16.50	15.25	No
		CH 149	5745		10.50	9.39	No
		CH 153	5765		10.50	9.27	No
		CH 157	5785		10.50	9.33	No
		CH 161	5805		10.50	9.31	No
		CH 165	5825		10.50	9.36	No
	Aux	CH 36	5180	MCS0	16.50	15.61	No
		CH 40	5200		16.50	15.57	No
		CH 44	5220		16.50	15.39	No
		CH 48	5240		16.50	15.44	No

		CH 52	5260		16.50	15.45	No
		CH 56	5280		16.50	15.50	No
		CH 60	5300		16.50	15.12	No
		CH 64	5320		16.50	15.08	No
		CH 100	5500		16.50	15.22	No
		CH 104	5520		16.50	15.09	No
		CH 108	5540		16.50	15.56	No
		CH 112	5560		16.50	15.43	No
		CH 116	5580		16.50	15.37	No
		CH 120	5600		16.50	15.67	No
		CH 124	5620		16.50	15.55	No
		CH 128	5640		16.50	15.43	No
		CH 132	5660		16.50	15.69	No
		CH 136	5680		16.50	15.76	No
		CH 140	5700		16.50	15.70	No
		CH 149	5745		11.00	10.07	No
		CH 153	5765		11.00	10.34	No
		CH 157	5785		11.00	10.50	No
		CH 161	5805		11.00	10.19	No
		CH 165	5825		11.00	10.28	No
Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11ac SISO 40M (5GHz)	Main	CH 38	5190	MCS0	14.50	13.43	No
		CH 46	5230		14.50	13.37	No
		CH 54	5270		14.50	13.18	No
		CH 62	5310		14.50	13.09	No
		CH 102	5510		14.50	13.10	No
		CH 110	5550		14.50	13.21	No
		CH 118	5590		14.50	13.25	No
		CH 126	5630		14.50	13.29	No
		CH 134	5670		14.50	13.45	No
		CH 151	5755		10.50	9.22	No
	Aux	CH 159	5795	MCS0	10.50	9.16	No
		CH 38	5190		15.50	14.80	No
		CH 46	5230		15.50	14.77	No
		CH 54	5270		15.50	14.62	No
		CH 62	5310		15.50	14.33	No
		CH 102	5510		15.50	14.36	No
		CH 110	5550		15.50	14.23	No
		CH 118	5590		15.50	14.50	No
		CH 126	5630		15.50	14.38	No
		CH 134	5670		15.50	14.34	No
		CH 151	5755		11.00	10.33	No
		CH 159	5795		11.00	10.25	No

Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11ac SISO 80M (5GHz)	Main	CH 42	5210	MCS0	14.50	13.23	No
		CH 58	5290		14.50	13.09	No
		CH 106	5530		14.50	12.93	No
		CH 122	5610		14.50	13.23	No
		CH 155	5775		10.50	9.18	No
	Aux	CH 42	5210	MCS0	15.50	14.47	No
		CH 58	5290		15.50	14.37	No
		CH 106	5530		15.50	14.07	No
		CH 122	5610		15.50	14.41	No
		CH 155	5775		11.00	10.06	No
Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11ac SISO 160M (5GHz)	Main	CH 50	5250	MCS0	14.50	12.84	No
		CH 114	5570		14.50	12.88	No
	Aux	CH 50	5250	MCS0	15.50	13.10	No
		CH 114	5570		15.50	12.89	No
Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11n MIMO 20M (5GHz)	Main	CH 36	5180	MCS8	13.50	11.95	No
		CH 40	5200		13.50	11.87	No
		CH 44	5220		13.50	11.84	No
		CH 48	5240		13.50	11.90	No
		CH 52	5260		13.50	11.94	No
		CH 56	5280		13.50	11.79	No
		CH 60	5300		13.50	11.83	No
		CH 64	5320		13.50	11.80	No
		CH 100	5500		13.50	11.62	No
		CH 104	5520		13.50	11.74	No
		CH 108	5540		13.50	11.68	No
		CH 112	5560		13.50	11.80	No
		CH 116	5580		13.50	11.66	No
		CH 120	5600		13.50	11.96	No
		CH 124	5620		13.50	11.91	No
		CH 128	5640		13.50	11.87	No
		CH 132	5660		13.50	11.79	No
		CH 136	5680		13.50	11.84	No
		CH 140	5700		13.50	11.88	No
		CH 149	5745		8.00	6.63	No
		CH 153	5765		8.00	6.55	No
		CH 157	5785		8.00	6.56	No
		CH 161	5805		8.00	6.60	No
		CH 165	5825		8.00	6.61	No
	Aux	CH 36	5180	MCS8	13.50	12.84	No
		CH 40	5200		13.50	12.85	No
		CH 44	5220		13.50	12.73	No
		CH 48	5240		13.50	12.88	No
		CH 52	5260		13.50	12.67	No
		CH 56	5280		13.50	12.74	No
		CH 60	5300		13.50	12.25	No
		CH 64	5320		13.50	12.13	No
		CH 100	5500		13.50	12.18	No
		CH 104	5520		13.50	12.21	No

		CH 108	5540		13.50	12.19	No
		CH 112	5560		13.50	12.22	No
		CH 116	5580		13.50	12.53	No
		CH 120	5600		13.50	12.48	No
		CH 124	5620		13.50	12.61	No
		CH 128	5640		13.50	12.58	No
		CH 132	5660		13.50	12.74	No
		CH 136	5680		13.50	12.69	No
		CH 140	5700		13.50	12.88	No
		CH 149	5745		8.00	6.80	No
		CH 153	5765		8.00	7.09	No
		CH 157	5785		8.00	7.12	No
		CH 161	5805		8.00	6.84	No
		CH 165	5825		8.00	7.11	No
	Sum	CH 36	5180	MCS8	16.50	15.43	No
		CH 40	5200		16.50	15.40	No
		CH 44	5220		16.50	15.32	No
		CH 48	5240		16.50	15.43	No
		CH 52	5260		16.50	15.33	No
		CH 56	5280		16.50	15.30	No
		CH 60	5300		16.50	15.06	No
		CH 64	5320		16.50	14.98	No
		CH 100	5500		16.50	14.92	No
		CH 104	5520		16.50	14.99	No
		CH 108	5540		16.50	14.95	No
		CH 112	5560		16.50	15.03	No
		CH 116	5580		16.50	15.13	No
		CH 120	5600		16.50	15.24	No
		CH 124	5620		16.50	15.28	No
		CH 128	5640		16.50	15.25	No
		CH 132	5660		16.50	15.30	No
		CH 136	5680		16.50	15.30	No
		CH 140	5700		16.50	15.42	No
		CH 149	5745		11.00	9.73	No
		CH 153	5765		11.00	9.84	No
		CH 157	5785		11.00	9.86	No
		CH 161	5805		11.00	9.73	No
		CH 165	5825		11.00	9.88	No
Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11n MIMO 40M (5GHz)	Main	CH 38	5190	MCS8	12.00	10.52	No
		CH 46	5230		12.00	10.49	No
		CH 54	5270		12.00	10.33	No
		CH 62	5310		12.00	10.25	No
		CH 102	5510		12.00	10.11	No
		CH 110	5550		12.00	10.24	No
		CH 118	5590		12.00	10.20	No
		CH 126	5630		12.00	10.27	No
		CH 134	5670		12.00	10.31	No
		CH 151	5755		8.00	6.40	No
		CH 159	5795		8.00	6.34	No
	Aux	CH 38	5190	MCS8	12.00	11.23	No
		CH 46	5230		12.00	11.17	No
		CH 54	5270		12.00	11.13	No
		CH 62	5310		12.00	10.77	No
		CH 102	5510		12.00	10.56	No

		CH 110	5550		12.00	10.49	No
		CH 118	5590		12.00	10.74	No
		CH 126	5630		12.00	10.84	No
		CH 134	5670		12.00	11.03	No
		CH 151	5755		8.00	7.14	No
		CH 159	5795		8.00	7.26	No
	Sum	CH 38	5190	MCS8	15.00	13.90	No
		CH 46	5230		15.00	13.85	No
		CH 54	5270		15.00	13.76	No
		CH 62	5310		15.00	13.53	No
		CH 102	5510		15.00	13.35	No
		CH 110	5550		15.00	13.38	No
		CH 118	5590		15.00	13.49	No
		CH 126	5630		15.00	13.57	No
		CH 134	5670		15.00	13.70	No
		CH 151	5755		11.00	9.80	No
		CH 159	5795		11.00	9.83	No
Mode	Antenna	Channel	Frequency(MHz)	Data Rate (Mbps)	Tune-up	Average Power(dBm)	SAR Test(Yes/No)
802.11ac MIMO 20M (5GHz)	Main	CH 36	5180	MCS0	13.50	12.22	No
		CH 40	5200		13.50	12.19	No
		CH 44	5220		13.50	12.31	No
		CH 48	5240		13.50	12.11	No
		CH 52	5260		13.50	12.08	No
		CH 56	5280		13.50	12.03	No
		CH 60	5300		13.50	11.95	No
		CH 64	5320		13.50	11.93	No
		CH 100	5500		13.50	11.75	No
		CH 104	5520		13.50	11.80	No
		CH 108	5540		13.50	11.69	No
		CH 112	5560		13.50	11.84	No
		CH 116	5580		13.50	12.08	No
		CH 120	5600		13.50	12.18	No
		CH 124	5620		13.50	12.21	No
		CH 128	5640		13.50	11.99	No
		CH 132	5660		13.50	11.84	No
		CH 136	5680		13.50	12.05	No
		CH 140	5700		13.50	12.14	No
		CH 149	5745		8.00	6.69	No
		CH 153	5765		8.00	6.81	No
		CH 157	5785		8.00	6.66	No
		CH 161	5805		8.00	6.67	No
		CH 165	5825		8.00	6.58	No
	Aux	CH 36	5180	MCS0	13.50	12.81	No
		CH 40	5200		13.50	12.76	No
		CH 44	5220		13.50	12.88	No
		CH 48	5240		13.50	12.61	No
		CH 52	5260		13.50	12.70	No
		CH 56	5280		13.50	12.72	No
		CH 60	5300		13.50	12.35	No
		CH 64	5320		13.50	12.21	No
		CH 100	5500		13.50	12.19	No
		CH 104	5520		13.50	12.07	No
		CH 108	5540		13.50	12.33	No
		CH 112	5560		13.50	12.42	No
		CH 116	5580		13.50	12.57	No

		CH 120	5600		13.50	12.53	No
		CH 124	5620		13.50	12.67	No
		CH 128	5640		13.50	12.51	No
		CH 132	5660		13.50	12.88	No
		CH 136	5680		13.50	12.74	No
		CH 140	5700		13.50	12.93	No
		CH 149	5745		8.00	7.32	No
		CH 153	5765		8.00	7.41	No
		CH 157	5785		8.00	7.58	No
		CH 161	5805		8.00	7.60	No
		CH 165	5825		8.00	7.55	No
	Sum	CH 36	5180	MCS0	16.50	15.54	No
		CH 40	5200		16.50	15.49	No
		CH 44	5220		16.50	15.61	No
		CH 48	5240		16.50	15.38	No
		CH 52	5260		16.50	15.41	No
		CH 56	5280		16.50	15.40	No
		CH 60	5300		16.50	15.16	No
		CH 64	5320		16.50	15.08	No
		CH 100	5500		16.50	14.99	No
		CH 104	5520		16.50	14.95	No
		CH 108	5540		16.50	15.03	No
		CH 112	5560		16.50	15.15	No
		CH 116	5580		16.50	15.34	No
		CH 120	5600		16.50	15.37	No
		CH 124	5620		16.50	15.46	No
		CH 128	5640		16.50	15.27	No
		CH 132	5660		16.50	15.40	No
		CH 136	5680		16.50	15.42	No
		CH 140	5700		16.50	15.56	No
		CH 149	5745		11.00	10.03	No
		CH 153	5765		11.00	10.13	No
		CH 157	5785		11.00	10.15	No
		CH 161	5805		11.00	10.17	No
		CH 165	5825		11.00	10.10	No
Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11ac MIMO 40M (5GHz)	Main	CH 38	5190	MCS0	12.00	10.75	No
		CH 46	5230		12.00	10.81	No
		CH 54	5270		12.00	10.50	No
		CH 62	5310		12.00	10.33	No
		CH 102	5510		12.00	10.29	No
		CH 110	5550		12.00	10.33	No
		CH 118	5590		12.00	10.48	No
		CH 126	5630		12.00	10.43	No
		CH 134	5670		12.00	10.58	No
		CH 151	5755		8.00	6.66	No
		CH 159	5795		8.00	6.58	No
	Aux	CH 38	5190	MCS0	12.00	11.45	No
		CH 46	5230		12.00	11.37	No
		CH 54	5270		12.00	11.42	No
		CH 62	5310		12.00	11.05	No
		CH 102	5510		12.00	10.87	No
		CH 110	5550		12.00	10.94	No
		CH 118	5590		12.00	10.92	No
		CH 126	5630		12.00	11.25	No

		CH 134	5670		12.00	11.30	No
		CH 151	5755		8.00	7.41	No
		CH 159	5795		8.00	7.54	No
	Sum	CH 38	5190	MCS0	15.00	14.12	No
		CH 46	5230		15.00	14.11	No
		CH 54	5270		15.00	13.99	No
		CH 62	5310		15.00	13.72	No
		CH 102	5510		15.00	13.60	No
		CH 110	5550		15.00	13.66	No
		CH 118	5590		15.00	13.72	No
		CH 126	5630		15.00	13.87	No
		CH 134	5670		15.00	13.97	No
		CH 151	5755		11.00	10.06	No
		CH 159	5795		11.00	10.10	No
Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11ac MIMO 80M (5GHz)	Main	CH 42	5210	MCS0	12.00	9.94	No
		CH 58	5290		12.00	9.79	No
		CH 106	5530		12.00	9.81	No
		CH 122	5610		12.00	10.05	No
		CH 155	5775		8.00	6.12	No
	Aux	CH 42	5210	MCS0	12.00	10.33	No
		CH 58	5290		12.00	10.36	No
		CH 106	5530		12.00	9.92	No
		CH 122	5610		12.00	10.09	No
		CH 155	5775		8.00	6.55	No
	Sum	CH 42	5210	MCS0	15.00	13.15	No
		CH 58	5290		15.00	13.09	No
		CH 106	5530		15.00	12.88	No
		CH 122	5610		15.00	13.08	No
		CH 155	5775		11.00	9.35	No
Mode	Antenna	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
802.11ac MIMO 160 (5GHz)	Main	CH 50	5250	MCS0	12.00	9.61	No
		CH 114	5570		12.00	9.57	No
	Aux	CH 50	5250	MCS0	12.00	10.08	No
		CH 114	5570		12.00	9.74	No
	Sum	CH 50	5250	MCS0	15.00	12.86	No
		CH 114	5570		15.00	12.67	No

Table 10: Test results conducted power measurement WiFi 5G(MCC of CE countries)

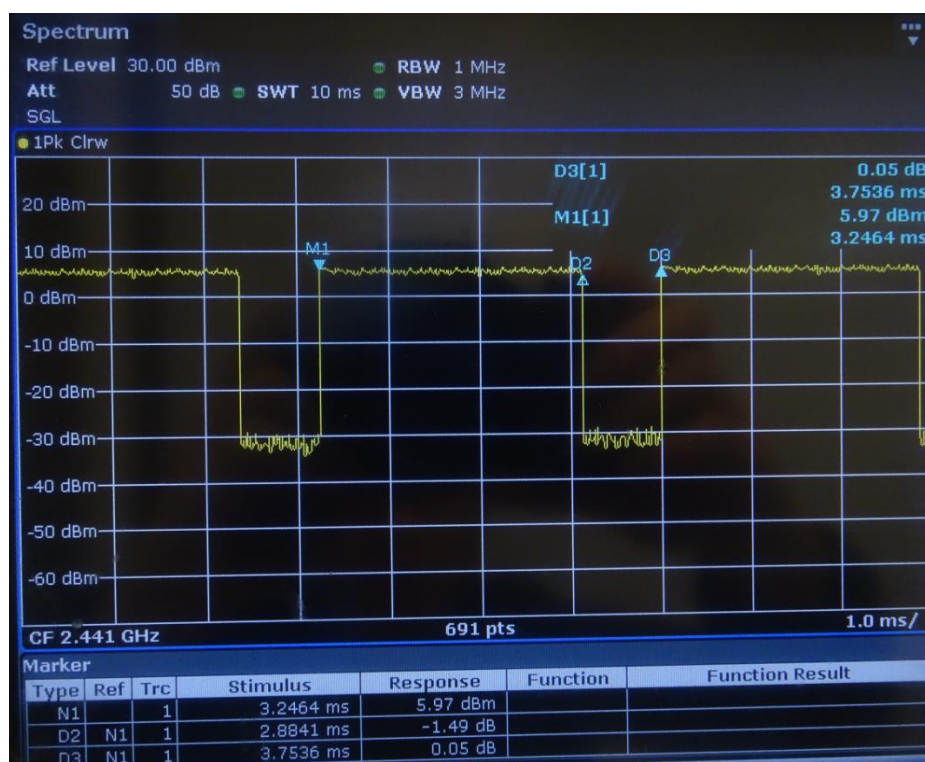
7.1.3 Conducted power of BT

BT	Tune-up Max.	Average Conducted Power (dBm)		
		0CH	39CH	78CH
DH5	10.70	9.48	10.25	10.50
2DH5	6.70	6.24	6.18	5.97
3DH5	6.70	6.22	6.16	5.93
BT	Tune-up Max.	Average Conducted Power (dBm)		
		0CH	19CH	39CH
BLE	6.50	4.68	4.48	4.20

Table 11: Test results conducted power measurement BT

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

Figure: Bluetooth Transmission Plot



So the bluetooth duty cycle is calculated as below:

$$\text{Duty Cycle} = \text{pulse width} \times 100\% = \frac{2.88\text{ms}}{3.75\text{ms}} \times 100\% = 77\%$$

7.2 SAR measurement Results

General Notes:

- 1) Per KDB 447498 D01, all SAR measurement results are scaled to the maximum tune-up tolerance limit to demonstrate SAR compliance.
- 2) Per KDB 447498 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:
 - $\leq 0.8\text{W/kg}$ for 1-g or 2.0W/kg for 10-g respectively, when the transmission band is $\leq 100\text{MHz}$.
 - $\leq 0.6\text{ W/kg}$ or 1.5 W/kg , for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz.
 - $\leq 0.4\text{ W/kg}$ or 1.0 W/kg , for 1-g or 10-g respectively, when the transmission band is $\geq 200\text{ MHz}$.When the maximum output power variation across the required test channels is $> \frac{1}{2}\text{ dB}$, instead of the middle channel, the highest output power channel must be used.
- 3) Per KDB 865664 D01, for each frequency band, repeated SAR measurement is required only when the measured SAR is $\geq 0.8\text{W/kg}$; if the deviation among the repeated measurement is $\leq 20\%$, and the measured SAR $< 1.45\text{W/kg}$, only one repeated measurement is required.
- 4) Per KDB 865664 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 $> 1.5\text{ W/kg}$, or $> 7.0\text{ W/kg}$ for occupational exposure. The published RF exposure KDB procedures may require additional plots; for example, to support SAR to peak location separation ratio test exclusion and/or volume scan post-processing (Refer to appendix B for details).

WiFi Notes:

Per KDB 248227 D01:

- 1) When reported SAR for the initial test position is $\leq 0.4\text{W/kg}$, 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 $\leq 0.8\text{W/kg}$ 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 $> 0.8\text{ W/kg}$, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the *reported* SAR is $\leq 1.2\text{ W/kg}$ or all required channels are tested..
- 2) When the DSSS *reported* SAR of the highest measured maximum output power channel for the exposure configuration is $\leq 0.8\text{ W/kg}$, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
- 3) When the highest *reported* SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is $\leq 1.2\text{ W/kg}$, SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations
- 4) The highest SAR measured for the initial test position or initial test configuration should be used to determine SAR test exclusion according to the sum of 1-g SAR and SAR peak to location ratio provisions in KDB 447498. In addition, a test lab may also choose to perform standalone SAR measurements for test positions and 802.11 configurations that are not required by the initial test position or initial test configuration procedures and apply the results to determine simultaneous transmission SAR test exclusion, according to sum of 1-g and SAR peak to location ratio requirements to reduce the number of simultaneous transmission SAR measurements.
- 5) For WIFI 2.4G MIMO, SAR is measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

6) For WIFI 5G MIMO, SAR is measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

BT Notes:

The reported SAR for BT is scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

7.2.1 SAR measurement Results of WiFi 2.4G

Test Position of Body	Dist.	Test Channel /Freq.(MHz)	Test Mode	Area Scan 1-g SAR (W/kg)	Measured SAR(W/kg)		Power Drift (dB)	Actual duty cycle	Scaled 1-g SAR (W/kg)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
					1-g	10-g								
Main Antenna														
MACHR-W29 SAR test data														
Bottom Side	0mm	10/2457	802.11b	0.416	0.501	0.197	0.13	98%	0.511	15.87	17.00	0.663	Battery 1#	/
Bottom Side	0mm	10/2457	802.11b	0.435	0.553	0.219	0.00	98%	0.564	15.87	17.00	0.732	Battery 2#	/
Bottom Side	0mm	2/2417	802.11b	0.391	0.495	0.197	0.12	98%	0.505	15.71	17.00	0.680	Battery 2#	/
Bottom Side	0mm	6/2437	802.11b	0.410	0.559	0.219	0.15	98%	0.570	15.75	17.00	0.761	Battery 2#	Yes
MACHR-W19 tested at the SAR worse case of MACHR-W29														
Bottom Side	0mm	6/2437	802.11b	0.415	0.461	0.184	0.00	98%	0.470	15.75	17.00	0.627	Battery 2#	/
Aux Antenna														
MACHR-W29 SAR test data														
Bottom Side	0mm	10/2457	802.11b	0.351	0.493	0.202	-0.10	98%	0.503	15.60	17.00	0.694	Battery 1#	/
Bottom Side	0mm	10/2457	802.11b	0.289	0.484	0.196	-0.07	98%	0.494	15.60	17.00	0.682	Battery 2#	/
Bottom Side	0mm	2/2417	802.11b	0.342	0.496	0.201	0.12	98%	0.506	15.50	17.00	0.715	Battery 1#	Yes
Bottom Side	0mm	6/2437	802.11b	0.306	0.414	0.173	-0.05	98%	0.422	15.52	17.00	0.594	Battery 1#	/
MACHR-W19 tested at the SAR worse case of MACHR-W29														
Bottom Side	0mm	2/2417	802.11b	0.374	0.491	0.195	0.13	98%	0.501	15.50	17.00	0.708	Battery 1#	/
MIMO Mode														
MACHR-W29 SAR test data														
Bottom Side	0mm	10/2457	802.11n(20M)	0.137	0.166	0.067	0.14	98%	0.169	15.67	17.00	0.230	Battery 1#	/
Bottom Side	0mm	10/2457	802.11n(20M)	0.200	0.279	0.111	-0.05	98%	0.285	15.67	17.00	0.387	Battery 2#	Yes
Bottom Side	0mm	2/2417	802.11n(20M)	0.170	0.227	0.090	0.12	98%	0.232	15.47	17.00	0.329	Battery 2#	/
Bottom Side	0mm	6/2437	802.11n(20M)	0.199	0.235	0.091	-0.15	98%	0.240	15.57	17.00	0.333	Battery 2#	/
MACHR-W19 tested at the SAR worse case of MACHR-W29														
Bottom Side	0mm	10/2457	802.11n(20M)	0.200	0.241	0.096	0.17	98%	0.246	15.67	17.00	0.334	Battery 2#	/

Table 12: Body SAR test results of WiFi 2.4G

Note:

- 1) Per KDB248227D01, for Body SAR test of WiFi 2.4G SISO(MAIN or AUX), SAR is measured for 2.4 GHz 802.11b DSSS using the initial test position procedure. The highest reported SAR for DSSS is adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is < 1.2 W/kg, so SAR for 802.11g/n is not required.
- 2) Per KDB248227D01, for Body SAR test of WiFi 2.4G MIMO, SAR is measured for 2.4 GHz 802.11n 20M using the initial test position procedure. The highest reported SAR for 802.11n 20M is adjusted by the ratio of 802.11n 40M to 802.11n 20M specified maximum output power and the adjusted SAR is < 1.2 W/kg, so SAR for 802.11n 40M is not required.

7.2.2 SAR measurement Results of WiFi 5G

Test Position of Body	Dist.	Test Channel /Freq.(MHz)	Test Mode	Area Scan 1-g SAR (W/kg)	Measured SAR(W/kg)		Power Drift (dB)	Actual duty cycle	Scaled 1-g SAR (W/kg)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot
					1-g	10-g								
Main Antenna														
MACHR-W29 SAR test data														
Test data of U-NII-2A band														
Bottom Side	0mm	58/5290	802.11ac(80M)	0.230	0.254	0.084	0.02	90%	0.282	8.97	10.50	0.401	Battery 1#	/
Bottom Side	0mm	58/5290	802.11ac(80M)	0.221	0.226	0.073	-0.04	90%	0.251	8.97	10.50	0.357	Battery 2#	/
Test data of U-NII-2C band														
Bottom Side	0mm	114/5570	802.11ac(160M)	0.321	0.353	0.115	-0.03	90%	0.392	8.75	10.50	0.587	Battery 1#	/
Bottom Side	0mm	114/5570	802.11ac(160M)	0.326	0.382	0.125	0.07	90%	0.424	8.75	10.50	0.635	Battery 2#	/
Test data of U-NII-3 band														
Bottom Side	0mm	155/5775	802.11ac(80M)	0.374	0.402	0.132	-0.15	90%	0.447	9.35	10.50	0.582	Battery 1#	/
Bottom Side	0mm	155/5775	802.11ac(80M)	0.392	0.442	0.144	0.03	90%	0.491	9.35	10.50	0.640	Battery 2#	Yes
MACHR-W19 tested at the SAR worse case of MACHR-W29														
Bottom Side	0mm	155/5775	802.11ac(80M)	0.325	0.276	0.073	-0.18	90%	0.307	9.35	10.50	0.400	Battery 2#	/
Aux Antenna														
MACHR-W29 SAR test data														
Test data of U-NII-2A band														
Bottom Side	0mm	58/5290	802.11ac(80M)	0.242	0.266	0.093	0.07	90%	0.296	9.88	11.00	0.383	Battery 1#	/
Bottom Side	0mm	58/5290	802.11ac(80M)	0.217	0.226	0.079	-0.06	90%	0.251	9.88	11.00	0.325	Battery 2#	/
Test data of U-NII-2C band														
Bottom Side	0mm	114/5570	802.11ac(160M)	0.335	0.364	0.123	-0.08	90%	0.404	9.25	11.00	0.605	Battery 1#	Yes
Bottom Side	0mm	114/5570	802.11ac(160M)	0.289	0.302	0.102	-0.10	90%	0.336	9.25	11.00	0.502	Battery 2#	/
Test data of U-NII-3 band														
Bottom Side	0mm	155/5775	802.11ac(80M)	0.276	0.328	0.111	-0.11	90%	0.364	10.04	11.00	0.455	Battery 1#	/
Bottom Side	0mm	155/5775	802.11ac(80M)	0.273	0.298	0.099	0.00	90%	0.331	10.04	11.00	0.413	Battery 2#	/
MACHR-W19 tested at the SAR worse case of MACHR-W29														
Bottom Side	0mm	114/5570	802.11ac(160M)	0.259	0.282	0.096	0.18	90%	0.313	9.25	11.00	0.469	Battery 1#	/
MIMO Mode														
MACHR-W29 SAR test data														
Test data of U-NII-2A band														
Bottom Side	0mm	58/5290	802.11ac(80M)	0.110	0.113	0.037	-0.13	90%	0.126	10.04	11.00	0.157	Battery 1#	/
Bottom Side	0mm	58/5290	802.11ac(80M)	0.145	0.174	0.058	-0.10	90%	0.193	10.04	11.00	0.241	Battery 2#	/
Test data of U-NII-2C band														
Bottom Side	0mm	114/5570	802.11ac(160M)	0.184	0.208	0.067	0.00	90%	0.231	10.11	11.00	0.284	Battery 1#	/
Bottom Side	0mm	114/5570	802.11ac(160M)	0.166	0.162	0.050	-0.13	90%	0.180	10.11	11.00	0.221	Battery 2#	/
Test data of U-NII-3 band														
Bottom Side	0mm	155/5775	802.11ac(80M)	0.247	0.250	0.078	0.00	90%	0.278	10.15	11.00	0.338	Battery 1#	Yes
Bottom Side	0mm	155/5775	802.11ac(80M)	0.191	0.209	0.065	-0.14	90%	0.232	10.15	11.00	0.282	Battery 2#	/
MACHR-W19 tested at the SAR worse case of MACHR-W29														
Bottom Side	0mm	155/5775	802.11ac(80M)	0.189	0.201	0.063	0.00	90%	0.223	10.15	11.00	0.272	Battery 1#	/

Table 13: Body SAR test results of WiFi 5G

Note:

1)Per KDB248227D01, for Body SAR test of WiFi 5G U-NII-2A band, SAR is measured for 5GHz 802.11ac 80M using the initial test position procedure. The highest reported SAR is adjusted by the ratio of 802.11ac 80M to other WiFi 5G mode specified maximum output power and the adjusted SAR is < 1.2 W/kg, so SAR for other WiFi 5G mode is not required.

2)Per KDB248227D01, for Body SAR test of WiFi 5G U-NII-2C band, SAR is measured for 5GHz 802.11ac 160M using the initial test position procedure. The highest reported SAR is adjusted by the ratio of 802.11ac 160M to other WiFi 5G mode specified maximum output power and the adjusted SAR is < 1.2 W/kg, so SAR for other WiFi 5G mode is not required.

3)Per KDB248227D01, for Body SAR test of WiFi 5G U-NII-3 band, SAR is measured for 5GHz 802.11ac 80M using the initial test position procedure. The highest reported SAR is adjusted by the ratio of 802.11ac 80M to other WiFi 5G mode specified maximum output power and the adjusted SAR is < 1.2 W/kg, so SAR for other WiFi 5G mode is not required.

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

7.2.3 SAR measurement Results of BT

Test Position of Body	Test Channel /Freq.(MHz)	Test Mode	Measured SAR(W/kg)		Power Drift (dB)	Actual duty cycle	Cal duty cycle	Scaled 1-g SAR (W/kg)	Conducted Power (dBm)	Tune-up Power (dBm)	Reported 1-g SAR (W/kg)	Accessory Information	SAR Plot.
			1-g	10-g									
MACHR-W29 SAR test data													
Bottom Side	39/2441	DH5	0.052	0.020	0.14	77%	100%	0.068	10.25	10.70	0.075	Battery 1#	/
Bottom Side	39/2441	DH5	0.055	0.021	-0.14	77%	100%	0.071	10.25	10.70	0.079	Battery 2#	/
Bottom Side	0/2402	DH5	0.057	0.022	-0.17	77%	100%	0.074	9.48	10.70	0.098	Battery 2#	/
Bottom Side	78/2480	DH5	0.050	0.019	-0.14	77%	100%	0.065	10.50	10.70	0.068	Battery 2#	/
MACHR-W19 tested at the SAR worse case of MACHR-W29													
Bottom Side	0/2402	DH5	0.064	0.025	-0.10	77%	100%	0.083	9.48	10.70	0.110	Battery 2#	Yes

Table 14: Body SAR test results of BT

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.

The detailed location of the Tx antennas inside the device refers to Appendix E.

7.3.1 Simultaneous Transmission Possibilities

The Simultaneous Transmission Possibilities of this device are as below:

No.	Simultaneous Tx Combination	Body
1	wifi 5G Main+BT	Yes
2	wifi 5G Aux+BT	Yes
3	wifi 5G MIMO+BT	Yes
4	wifi 2.4G Main+BT	Yes
5	wifi 5G Main+2.4G Main	Yes
6	wifi 5G Main+2.4G Aux	Yes
7	wifi 5G Aux+2.4G Main	Yes
8	wifi 5G Aux+2.4G Aux	Yes
9	wifi 5G Aux+2.4G Main+ BT	Yes
10	wifi 5G Main+2.4G Main+ BT	Yes

Table 15: Simultaneous Transmission Possibilities

Note:

- 1) WiFi 2.4G Aux and Bluetooth can't transmit simultaneously, because they share the same antenna.
- 2) Wi-Fi 2.4G has two TX antennas. Wi-Fi 2.4G 802.11n support 2*2 MIMO function.
- 3) Wi-Fi 5G has two TX antennas. Wi-Fi 5G 802.11 n/ac support 2*2 MIMO function.

7.3.2 SAR Summation Scenario

Test Position	WiFi Max _{SAR} (W/kg)						BT Max _{SAR} (W/kg)	Σ1-g SAR (W/kg)									
	WiFi 2.4G MAIN	WiFi 2.4G AUX	WiFi 2.4G MIMO	WiFi 5G MAIN	WiFi 5G AUX	WiFi 5G MIMO											
	1	2	3	4	5	6		1+4	1+5	1+7	2+4	2+5	4+7	5+7	6+7	1+4+7	1+5+7
Body 0mm (Bottom Side)	0.761	0.715	0.387	0.640	0.605	0.338	0.110	1.401	1.366	0.871	1.355	1.320	0.750	0.715	0.448	1.511	1.476

Table 16: SAR Simultaneous Tx Combination

7.3.3 Simultaneous Transmission Conclusion

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

Appendix A. System Check Plots

(Please See Appendix No.: SYBH(Z-SAR)20190123011002-2A, total: 10 pages)

Appendix B. SAR Measurement Plots

(Please See Appendix No.: SYBH(Z-SAR)20190123011002-2B, total: 8 pages)

Appendix C. Calibration Certificate

(Please See Appendix No.: SYBH(Z-SAR)20190123011002-2C, total: 86 pages)

Appendix D. Photo documentation

(Please See Appendix No.: SYBH(Z-SAR)20190123011002-2D, total: 4 pages)

Appendix E. Antenna Location

(Please See Appendix No.: SYBH(Z-SAR)20190123011002-2E, total: 1 page)

End