KDB 865664 D01 SAR Measurement 100MHz to 6GHz
FCC 47 CFR part 2 (2.1093)

SAR EVALUATION REPORT

For

Laptop Computer with IEEE 802.11a/b/g/n/ac (MIMO 3x3) and Bluetooth Radio

Model: A2251
FCC ID: BCGA2251

REPORT NUMBER UL-SAR-RP13041774JD16A V1.0
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REVISION HISTORY

Version	Issue Date	Revisions	Revised By
1.0	10 March 2020	Initial Issue	--

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1. Attestation of Test Results

Applicant Name	Apple Inc.					
Model	A2251					
Test Device is	A representative test sample					
Device category	Portable					
Date Tested	03 December 2019 to 12 December 2019					
ICNIRP Guidelines Limits for SAR Exposure Characteristics	General Population/Localised SAR (Head and trunk) – SAR limit 1.6 W/kg					
The highest reported SAR values	RF Exposure Conditions		Equipment Class			
			Licensed	DTS	U-NII	DSS
	Standalone	Body	N/A	0.95 W/Kg	1.04W/Kg	0.21 W/Kg
	Simultaneous Transmission	Body	N/A	1.24 W/Kg	1.24 W/Kg	1.24 W/Kg
Applicable Standards	FCC 47 CFR part 2 (2.1093) KDB publication					
Test Results	Pass					

UL Verification Services Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties are in accordance with the above standard and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample(s), under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by UKAS. This report is written to support regulatory compliance of the applicable standards stated above.

Issued By:	Prepared By:
Naseer Mirza Lead Project Engineer UL VS Ltd.	Masood Khan Test Engineer UL VS Ltd.

2. Test Specification, Methods and Procedures

2.1. Test Specification

Reference:	KDB Publication Number: 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
Title:	SAR Measurement Requirements for 100 MHz to 6 GHz
Introduction:	The SAR Measurement procedures for 100MHz to 6GHz are described in this document. Field probes, tissue dielectric properties, SAR scans, measurement accuracy and variability of the measured results are discussed. The field probe and SAR scan requirements are derived from criteria considered in standard IEEE 1528-2013. The wireless product and technology specific procedures in applicable KDB publications are required to be used unless further guidance has been approved by the FCC.
Purpose of Test:	To determine if the Equipment Under Test complies with the Specific Absorption Rate for general population/uncontrolled exposure limit of 1.6 W/kg as specified in FCC 47 CFR part 2 (2.1093).

2.2. Methods and Procedures Reference Documentation

The methods and procedures used were as detailed in:

IEEE 1528:2013

IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communication Devices: Measurement Techniques.

FCC KDB Publication:
KDB 248227 D01 802.11 Wi-Fi SAR v02r02
KDB 447498 D01 General RF Exposure Guidance v06
KDB 616217 D04 SAR for laptop and tablets v01r02
KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
KDB 865664 D02 RF Exposure Reporting v01r02

2.3. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the methods & procedures section above. Section 4.3 contains a list of the test equipment used.

3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at

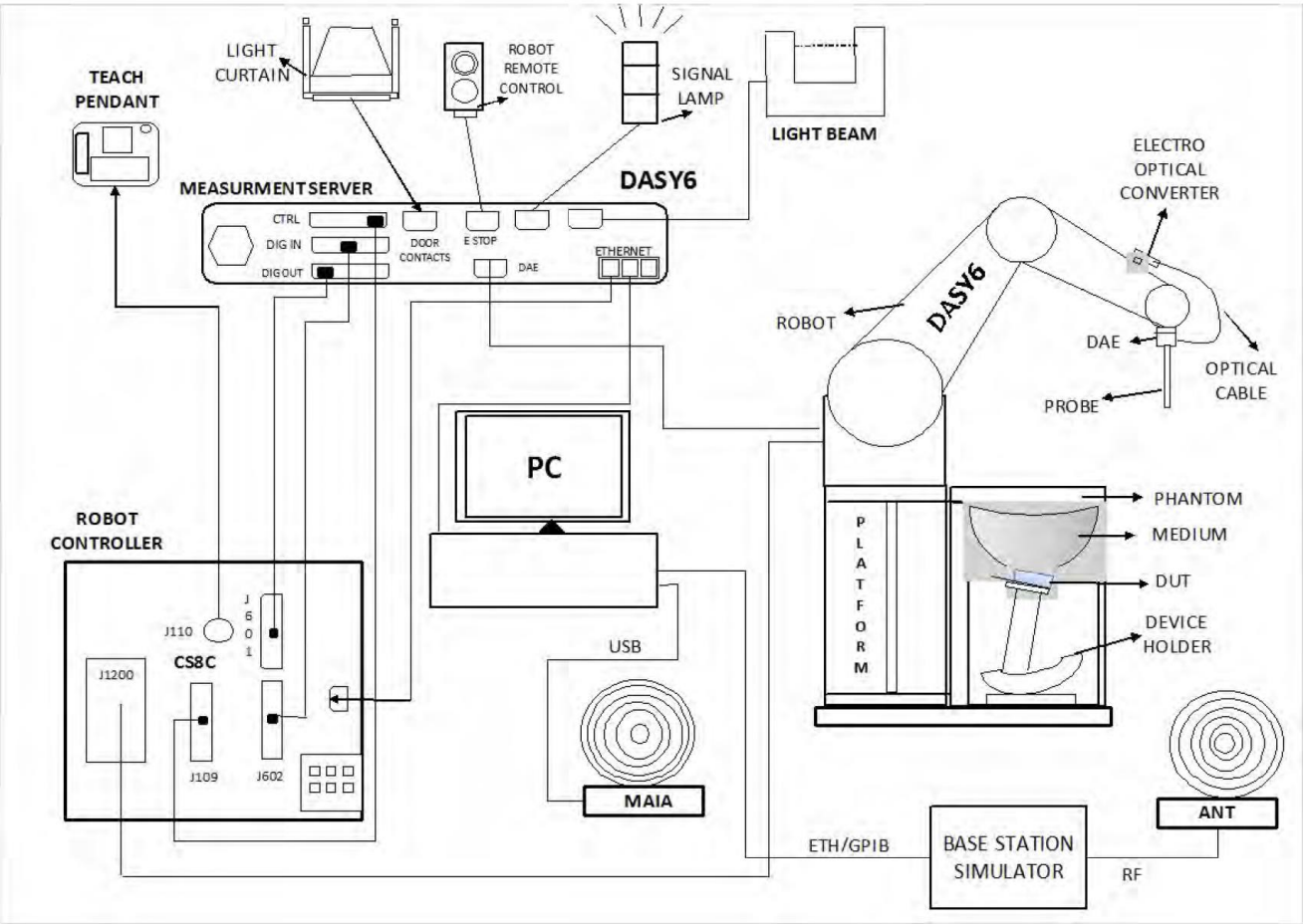
Horizon Unit 1-3, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, UK	Facility Type
SAR Lab 60	Controlled Environment Chamber
SAR Lab 61	Controlled Environment Chamber

UL Verification Services Ltd, is accredited by UKAS (United Kingdom Accreditation Service), Laboratory UKAS Code 0644.

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

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



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (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.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win 8.1 or Win 10 and the DASY software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

4.2. SAR Measurement Procedure

4.2.1. Normal SAR Measurement Procedure

The following procedure shall be performed for each of the test conditions Measure the local SAR at a test point within 8 mm of the phantom inner surface that is closest to the DUT.

a) Measure the two-dimensional SAR distribution within the phantom (area scan procedure).
b) The boundary of the measurement area shall not be closer than 20 mm from the phantom side walls. The distance between the measurement points should enable the detection of the location of local maximum with an accuracy of better than half the linear dimension of the tissue cube after interpolation. A maximum grid spacing of 20 mm for frequencies below 3 GHz and (60/f [GHz]) mm for frequencies of 3 GHz and greater is recommended. The maximum distance between the geometrical centre of the probe detectors and the inner surface of the phantom shall be 5 mm for frequencies below 3 GHz and δ ln(2)/2 mm for frequencies of 3 GHz and greater, where δ is the plane wave skin depth and ln(x) is the natural logarithm. The maximum variation of the sensor-phantom surface distance shall be ± 1 mm for frequencies below 3 GHz and ± 0,5 mm for frequencies of 3 GHz and greater. At all measurement points the angle of the probe with respect to the line normal to the surface should be less than 5°. If this cannot be achieved for a measurement distance to the phantom inner surface shorter than the probe diameter, additional uncertainty evaluation is needed.
c) From the scanned SAR distribution, identify the position of the maximum SAR value, in addition identify the positions of any local maxima with SAR values within 2 dB of the maximum value that will not be within the zoom scan of other peaks; additional peaks shall be measured only when the primary peak is within 2 dB 6 of the SAR compliance limit (e.g., 1 W/kg for 1,6 W /kg 1 g limit, or 1,26 W/kg for 2 W /kg, 10 g limit).
d) Measure the three-dimensional SAR distribution at the local maxima locations identified in step c) (zoom scan procedure). The horizontal grid step shall be (24 / f [GHz]) mm or less but not more than 8 mm. The minimum zoom scan size is 30 mm by 30 mm by 30 mm for frequencies below 3 GHz. For higher frequencies, the minimum zoom scan size can be reduced to 22 mm by 22 mm by 22 mm. The grid step in the vertical direction shall be (8-f [GHz]) mm or less but not more than 5 mm, if uniform spacing is used. If variable spacing is used in the vertical direction, the maximum spacing between the two closest measured points to the phantom shell shall be (12/f [GHz]) mm or less but not more than 4 mm, and the spacing between farther points shall increase by an incremental factor not exceeding 1,5. When variable spacing is used, extrapolation routines shall be tested with the same spacing as used in measurements. The maximum distance between the geometrical centre of the probe detectors and the inner surface of the phantom shall be 5 mm for frequencies below 3 GHz and δ ln(2)/2 mm for frequencies of 3 GHz and greater, where δ is the plane wave skin depth and ln(x) is the natural logarithm. Separate grids shall be centred on each of the local SAR maxima found in step c). Uncertainties due to field distortion between the media boundary and the dielectric enclosure of the probe should also be minimized, which is achieved if the distance between the phantom surface and physical tip of the probe is larger than probe tip diameter. Other methods may utilize correction procedures for these boundary effects that enable high precision measurements closer than half the probe diameter. For all measurement points, the angle of the probe with respect to the flat phantom surface shall be less than 5º.
e) Use post processing (e.g. interpolation and extrapolation) procedures to determine the local SAR values at the spatial resolution needed for mass averaging.
f) The local SAR should be measured at the same location as in Step a). SAR drift is assessed and reported in the uncertainty budget.
In the event that the evaluation of measurement drift exceeds the 5 % tolerance, it is required that SAR be reassessed following guidelines contained within this standard.
If the drift is larger than 5 %, then the measurement drift shall be considered a bias, not an uncertainty. A correction shall be applied to the measured SAR value. It is not necessary to record the drift in the uncertainty budget (i.e. ui = 0 %). The uncertainty budget reported in a measurement report should correspond to the highest SAR value reported (after correction, if applicable). Alternatively, the uncertainty budget reported should cover all measurements, i.e., it should report a conservative value.

Area Scan Parameters:

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 mm ± 1 mm	½·δ·ln(2) mm ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Zoom Scan Parameters:

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

4.3. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

UL No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
PRE0178316	Data Acquisition Electronics	SPEAG	DAE4	1541	14 Mar 2019	12
PRE0178317	Data Acquisition Electronics	SPEAG	DAE4	1542	13 Mar 2019	12
A1322	2450 MHz Dipole	SPEAG	D2450V2	725	08 Oct 2019	12
A2781	5.0 GHz Dipole Kit	SPEAG	D5GHzV2	1222	11 Oct 2019	12
PRE0178314	Probe	SPEAG	EX3DV4	7496	28 Mar 2019	12
PRE0178313	Probe	SPEAG	EX3DV4	7497	18 Mar 2019	12
A2810	Head Handset Positioner	SPEAG	MD4HHTV5	None	Calibrated before use	-
PRE0179700	Head Handset Positioner	SPEAG	MD4HHTV5	None	Calibrated as part of system	-
M1755	DAK Fluid Probe	SPEAG	SM DAK 040 CA	1089	Calibrated before use	-
A2621	Digital Camera	Nikon	S3600	41010357	N/A	-
PRE0151154	Network Analyser	R&S	ZND	100151	03 Jan 2019	12
PRE0190819	Phantom	SPEAG	ELI V5.0	2100	Calibrated as part of system	-
A2252	Phantom	SPEAG	ELI V5.0	1177	Calibrated as part of system	-
PRE0141350	Phantom Support Structure	SPEAG	Phantom Table	-	Calibrated as part of system	-
PRE0141347	Phantom Support Structure	SPEAG	Phantom Table	-	Calibrated as part of system	-
PRE0159220	PowerSource1	SPEAG	SE UMS 160 AB	1025	10 May 2019	12
PRE0191906	PowerSource1	SPEAG	SE UMS 160 BA	4012	01 Jun 2019	12
M1876	Robot Arm	Staubli	TX60 L	F14/5UA6A1/A/01	Calibrated as part of system	-
M1877	Robot Arm	Staubli	TX60 L	F14/5T5ZA1/A/01	Calibrated as part of system	-
G0611	Robot Power Supply	SPEAG	DASY52	F14/5UA6A1/C/01	Calibrated as part of system	-
G0612	Robot Power Supply	SPEAG	DASY52	F14/5T5ZA1/C/01	Calibrated as part of system	-
M1850	RS Hygrometer	RS Components	408-6109	D10Q61	20 Mar 2019	12
M1851	RS Hygrometer	RS Components	408-6109	D10Q65	20 Mar 2019	12
M1647	Signal Generator	R&S	HP 8648C	3537A01598	16 Jan 2019	12
M1908	Signal Generator	R&S	SMIQ 03B	1125.555.03	17 Jan 2019	12
M1838	Signal Generator	R&S	SME06	831377/005	21 Mar 2019	12
PRE0178154	Signal Generator	R&S	SMB 100A	175325	30 Apr 2019	12
M1840	Dual Channel Power Meter	R&S	NRVD	844860/040	18 Jan 2019	12
M263	Dual Channel Power Meter	R&S	NRVD	826558/004	21 Jan 2019	12
M1847	Power Sensor	R&S	NRV-Z1	831430/003	18 Jan 2019	12
M1848	Power Sensor	R&S	NRV-Z1	831430/004	17 Jan 2019	12

UL No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
M1855	Power Sensor	R&S	NRP-Z51	103246	18 Jan 2019	12
PRE0175232	Power Sensor	R&S	NRP-Z51	104649-JG	25 Mar 2019	12
PRE0151441	Power Sensor	R&S	NRP-Z51	102481	27 Mar 2019	12
M265	Power Sensor	R&S	NRV-Z1	893350/0017	21 Jan 2019	12
M1044	Power Sensor	R&S	NRV-Z1	893350/0019	18 Jan 2019	12
PRE0151441	Power Sensor	R&S	NRP8S	102481	27 Mar 2019	12
A2100	Directional Coupler	RF-Lambda	RFDC5M06G15	11101300748	Calibrated before use	-
PRE0141988	Directional Coupler	RF-Lambda	RFDC5M06G15	12042502539	Calibrated before use	-
A1938	Amplifier	Mini-Circuits	ZHL-42	QA0826002	Calibrated before use	-
A2403	Amplifier	Mini-Circuits	ZHL-42	15542	Calibrated before use	-
PRE0141987	Directional Coupler	RF-Lambda	RFDC5M06G15	12042502540	Calibrated before use	-
PRE0176840	RF Coax Cable	Huber+Suhner	Superflex 126	503318	Calibrated before use	-
PRE0176848	RF Coax Cable	Huber+Suhner	Superflex 126	503319	Calibrated before use	-
PRE0176855	RF Coax Cable	Huber+Suhner	Superflex 126	503321	Calibrated before use	-
PRE0176839	RF Coax Cable	Huber+Suhner	Superflex 126	503324	Calibrated before use	-
PRE0176843	RF Coax Cable	Huber+Suhner	Superflex 126	503326	Calibrated before use	-
PRE0176846	RF Coax Cable	Huber+Suhner	Superflex 126	503322	Calibrated before use	-
A2620	Amplifier	Mini-Circuits	ZHL-42	D080900-14	Calibrated before use	-
A2689	Amplifier	Mini-Circuits	ZVE-8G	910401427	Calibrated before use	-

4.3.1. SAR System Specifications

Robot System	
Positioner:	Stäubli Unimation Corp. Robot Model: TX60L
Repeatability:	±0.030 mm
No. of Axis:	6
Serial Number(s):	F14/5UA6A1/C/01 F14/5T5ZA1/C/01
Reach:	800 mm
Payload:	2.0 kg
Control Unit:	CS8C
Programming Language:	V+
Data Acquisition Electronic (DAE) System	
Serial Number:	DAE4 SN: 1541, 1542
PC Controller	
PC:	HP EliteDesk800
Operating System:	Windows 10
Data Card:	DASY Measurement Servers
Data Converter	
Features:	Signal Amplifier, multiplexer, A/D converted and control logic.
Software:	DASY6 PRO Software
Connecting Lines:	Optical downlink for data and status info. Optical uplink for commands and clock.
PC Interface Card	
Function:	24 bit (64 MHz) DSP for real time processing Link to DAE4 16 bit A/D converter for surface detection system serial link to robot direct emergency stop output for robot.
Phantom	
Phantom:	Eli Phantom
Shell Material:	Fibreglass
Thickness:	2.0 ±0.1 mm
E-Field Probe	
Model:	EX3DV4
Serial No:	7496, 7497
Construction:	Triangular core
Frequency:	10MHz to >6GHz
Linearity:	±0.2 dB (30 MHz to 6 GHz)
Probe Length (mm):	337
Probe Diameter (mm):	10
Tip Length (mm):	9
Tip Diameter (mm):	2.5
Sensor X Offset (mm):	1
Sensor Y Offset (mm):	1
Sensor Z Offset (mm):	1

5. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.
The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.
The uncertainty of the result may need to be taken into account when interpreting the measurement results.
The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Test Name	Confidence Level	Calculated Uncertainty
Uncertainty- Freq. < 3 GHz Head & Body Configuration 1g	95%	±28.54%
Uncertainty- Freq. > 3 GHz Body & Body Configuration 1g	95%	±26.64%

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

5.1. Uncertainty – Freq. < 3 GHz Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (1g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	10.100	10.100	normal (k=2)	2.0000	1.0000	5.050	5.050	∞
B	Axial Isotropy	0.500	0.500	Rectangular	1.7321	0.7071	0.204	0.204	∞
B	Hemispherical Isotropy	2.600	2.600	Rectangular	1.7321	0.7071	1.061	1.061	∞
B	Boundary Effect	1.000	1.000	Rectangular	1.7321	1.0000	0.577	0.577	∞
B	Linearity	0.600	0.600	normal (k=2)	2.0000	1.0000	0.300	0.300	∞
B	Detection Limits	0.250	0.250	Rectangular	1.7321	1.0000	0.144	0.144	∞
B	Readout Electronics	0.300	0.300	normal (k=1)	1.0000	1.0000	0.300	0.300	∞
B	Modulation Response Time	9.600	9.600	normal (k=2)	2.0000	1.0000	4.800	4.800	∞
B	Response Time	1.010	1.010	Rectangular	1.7321	1.0000	0.583	0.583	∞
B	Integration Time	4.320	4.320	Rectangular	1.7321	1.0000	2.494	2.494	∞
B	RF Ambient conditions	0.260	0.260	Rectangular	1.7321	1.0000	0.150	0.150	∞
B	Probe Positioner Mechanical Tolerance	0.020	0.020	Rectangular	1.7321	1.0000	0.012	0.012	∞
B	Probe Positioning with regard to Phantom Shell	0.400	0.400	Rectangular	1.7321	1.0000	0.231	0.231	∞
B	Extrapolation and integration/ Maximum SAR evaluation	2.000	2.000	Rectangular	1.7321	1.0000	1.155	1.155	∞
A	Test Sample Positioning	5.730	5.730	normal (k=1)	1.0000	1.0000	5.730	5.730	34.5
A	Device Holder uncertainty	7.480	7.480	normal (k=1)	1.0000	1.0000	7.480	7.480	5
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Phantom Shell Uncertainty	5.700	5.700	Rectangular	1.7321	1.0000	3.291	3.291	∞
B	Uncertainty in SAR correction for deviations in permittivity and conductivity	1.900	1.900	Rectangular	1.7321	1.0000	1.097	1.097	∞
B	Liquid Conductivity (measured value)	10.580	10.580	normal (k=1)	1.0000	0.5543	5.865	5.865	∞
B	Liquid Permittivity (measured value)	5.000	5.000	normal (k=1)	1.0000	0.2261	1.131	1.131	∞
B	Liquid Conductivity (temperature uncertainty)	1.300	1.300	Rectangular	1.7321	1.0000	0.751	0.751	∞
B	Liquid Permittivity (temperature uncertainty)	0.320	0.320	Rectangular	1.7321	1.0000	0.185	0.185	∞
	Combined standard uncertainty			t-distribution			14.27	14.27	63
	Expanded uncertainty			k = 2			28.54	28.54	63

5.2. Uncertainty – Freq. > 3 GHz Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (1g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	10.100	10.100	normal (k=2)	2.0000	1.0000	5.050	5.050	∞
B	Axial Isotropy	0.500	0.500	Rectangular	1.7321	0.7071	0.204	0.204	∞
B	Hemispherical Isotropy	2.600	2.600	Rectangular	1.7321	0.7071	1.061	1.061	∞
B	Boundary Effect	2.000	2.000	Rectangular	1.7321	1.0000	1.155	1.155	∞
B	Linearity	0.600	0.600	normal (k=2)	2.0000	1.0000	0.300	0.300	∞
B	Detection Limits	0.250	0.250	Rectangular	1.7321	1.0000	0.144	0.144	∞
B	Readout Electronics	0.300	0.300	normal (k=1)	1.0000	1.0000	0.300	0.300	∞
B	Modulation Response Time	9.600	9.600	normal (k=2)	2.0000	1.0000	4.800	4.800	∞
B	Response Time	1.010	1.010	Rectangular	1.7321	1.0000	0.583	0.583	∞
B	Integration Time	2.500	2.500	Rectangular	1.7321	1.0000	1.443	1.443	∞
B	RF Ambient conditions	0.260	0.260	Rectangular	1.7321	1.0000	0.150	0.150	∞
B	Probe Positioner Mechanical Tolerance	0.040	0.040	Rectangular	1.7321	1.0000	0.023	0.023	∞
B	Probe Positioning with regard to Phantom Shell	0.800	0.800	Rectangular	1.7321	1.0000	0.462	0.462	∞
B	Extrapolation and integration/ Maximum SAR evaluation	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
A	Test Sample Positioning	5.730	5.730	normal (k=1)	1.0000	1.0000	5.730	5.730	34.5
A	Device Holder uncertainty	7.480	7.480	normal (k=1)	1.0000	1.0000	7.480	7.480	5
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Phantom Shell Uncertainty	6.100	6.100	Rectangular	1.7321	1.0000	3.522	3.522	∞
B	Uncertainty in SAR correction for deviations in permittivity and conductivity	1.900	1.900	Rectangular	1.7321	1.0000	1.097	1.097	∞
B	Liquid Conductivity (measured value)	6.020	6.020	normal (k=1)	1.0000	0.2466	1.485	1.485	∞
B	Liquid Permittivity (measured value)	4.550	4.550	normal (k=1)	1.0000	0.1987	0.904	0.904	∞
B	Liquid Conductivity (temperature uncertainty)	1.430	1.430	Rectangular	1.7321	1.0000	0.826	0.826	∞
B	Liquid Permittivity (temperature uncertainty)	0.310	0.310	Rectangular	1.7321	1.0000	0.179	0.179	∞
	Combined standard uncertainty			t-distribution			13.18	13.18	45
	Expanded uncertainty			k = 2.021			26.64	26.64	45

6. Device Under Test (DUT) Information

6.1. DUT Description

DUT Description:	The device under test is a laptop with WLAN 2.4 GHz (802.11 b/g/n) with MIMO 3x3, WLAN 5.0 GHz {802.11a/n (HT20, HT40), 802.11ac (VHT20, VHT40, VHT80)} with MIMO 3x3 and *Bluetooth* (BDR, EDR and BLE).	
Serial Number:	**Radiated Samples**	C02ZH00EP1YX C02ZG00JP22J
	Conducted Sample	C02ZH00EP1YX C02ZG00JP22J
Hardware Version Number:	Rev 1	
Firmware WLAN):	9.30.318.2	
Firmware (BT):	44	
Country of Manufacture:	China	
Device dimension	304.1 x 212.4 x 14.7 mm (Length x Width x Height)	
Date of Receipt:	02 December 2019	

Antenna Type:	Internal integral	
Antenna Length:	Unknown	
Number of Antenna Positions:	Antenna WF2 (Core 0) - WLAN ~ Wi-Fi 2.4 GHz / 5.0 GHz	1 fixed
	Antenna WF1 (Core 1) - WLAN / WPAN ~ Wi-Fi 2.4 GHz / 5.0 GHz / BT	1 fixed
	Antenna WF3 (Core 2) - WLAN ~ Wi-Fi 2.4 GHz / 5.0 GHz / Auxiliary	1 fixed
Battery Type(s):	Embedded Li-ion	

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)	100%
	5.0 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT20) 802.11ac (VHT40) 802.11ac (VHT80)	100%
Bluetooth	2.4 GHz	Version 1.0 + BDR Version 2.1 + EDR Version 4.0 LE	32.25% (DH1) 66.68% (DH3) 77.52% (DH5)

Wireless Technologies (Continued)

Wi-Fi						
Band	Description					
	Channel No. 20 MHz BW	Freq. (MHz)	Channel No. 40 MHz BW	Freq. (MHz)	Channel No. 80 MHz BW	Freq. (MHz)
Wi-Fi 2.4 GHz (802.11b/g/n)	1	2412.0	N/A			
	2	2417.0				
	3	2422.0				
	4	2427.0				
	5	2432.0				
	6	2437.0				
	7	2442.0				
	8	2447.0				
	9	2452.0				
	10	2457.0				
	11	2462.0				
	12	2467.0				
	13	2472.0				
Wi-Fi 5.0 GHz 5.2 (U-NII-1) (802.11a/n/ac)	36	5180.0	38	5190.0		
	40	5200.0			42	5210.0
	44	5220.0	46	5230.0		
	48	5240.0				
Wi-Fi 5.0 GHz 5.3 (U-NII-2A) (802.11a/n/ac)	52	5260.0	54	5270.0		
	56	5280.0			58	5290.0
	60	5300.0	62	5310.0		
	64	5320.0				
Wi-Fi 5.0 GHz 5.6 (U-NII-2C) (802.11a/n/ac)	100	5500.0	102	5510.0		
	104	5520.0			106	5530.0
	108	5540.0	110	5550.0		
	112	5560.0				
	116	5580.0	118	5590.0		
	120	5600.0			122	5610.0
	124	5620.0	126	5630.0		
	128	5640.0				
	132	5660.0	134	5670.0		
	136	5680.0			138	5690.0
	140	5700.0	142	5710.0		
	144	5720.0				
Wi-Fi 5.0 GHz 5.8 (U-NII-3) (802.11a/n/ac)	149	5745.0	151	5755.0		
	153	5765.0			155	5775.0
	157	5785.0	159	5795.0		
	161	5805.0				
	165	5825.0				

Bluetooth				
Band	Description			
	Frequency Range: 2402 - 2480 MHz			
	Mode	Channel Number	Channel Description	Frequency (MHz)
Bluetooth	BDR/EDR Mode	0	Low	2402.0
		39	Middle	2441.0
		78	High	2480.0
	LE Mode	1	Low	2404.0
		19	Middle	2440.0
		38	High	2478.0

6.3. Nominal and Maximum Output power: Wi-Fi 2.4 GHz and Bluetooth

			Target + Max. Tolerances (dBm) - applicable to all antenna's (Core 0, Core 1 and Core 2)								
Band	**Channel**	**Centre Frequency (MHz)**	**802.11b (SISO)**	**802.11g (SISO)**	**802.11n HT20 (SISO)**	**802.11n HT20 (2 Tx, DSSS)**	**802.11n HT20 (2 Tx, non-TXBF)**	**802.11n HT20 (2 Tx, TXBF)**	**802.11n HT20 (3 Tx, DSSS)**	**802.11n HT20 (3 Tx, non-TXBF)**	**802.11n HT20 (3 Tx, TXBF)**
Wi-Fi 2.4GHz	1	2412	18.00	16.00	16.00	18.00	15.00	13.00	17.50	14.50	12.50
	2	2417	18.00	17.50	17.50	18.00	17.50	15.50	18.00	16.50	14.50
	3	2422	18.00	18.00	18.00	18.00	18.00	16.00	18.00	17.00	15.00
	4	2427	18.00	18.00	18.00	18.00	18.00	17.50	18.00	18.00	16.00
	5	2432	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	17.00
	6	2437	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
	7	2442	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
	8	2447	18.00	18.00	18.00	18.00	18.00	18.00	18.00	17.50	15.50
	9	2452	18.00	18.00	18.00	18.00	18.00	17.00	18.00	16.00	14.00
	10	2457	18.00	16.00	16.00	18.00	16.00	14.00	18.00	13.00	11.00
	11	2462	18.00	15.00	15.00	18.00	14.00	12.00	17.00	12.50	10.50
	12	2467	14.00	12.00	12.00	14.00	12.00	10.00	14.00	11.00	9.00
	13	2472	13.00	3.00	3.00	11.00	1.00	-1.00	10.00	0.50	-1.50

		Target + Max. Tolerances (dBm) - Applicable to Core 1 antenna		
Band	**Channel**	**BDR (SISO)**	**EDR (SISO)**	**BLE (SISO)**
Bluetooth	ALL	13.00	8.00	7.00

Note: Bluetooth operates only on Antenna Core 1

6.4. Nominal and Maximum Output power: Wi-Fi 5.0 GHz

			Target + Max. Tolerances (dBm) - applicable to all antenna's (Core 0, Core 1 and Core 2)							
Band	Channel (20 MHz BW)	Center Frequency (MHz)	802.11 a (SISO)	802.11n HT20 (SISO)	802.11n HT20 (2 Tx CDD, non-TXBF)	802.11n HT20 (2 Tx SDM, non-TXBF)	802.11n HT20 (2 Tx, TXBF)	802.11n HT20 (3 Tx CDD, non-TXBF)	802.11n HT20 (3 Tx SDM, non-TXBF)	802.11n HT20 (3 Tx, TXBF)
Sub Band 1 - 5.2 GHz	36	5180	13.50	13.50	13.50	13.50	12.00	10.50	13.50	8.50
	40	5200	13.50	13.50	13.50	13.50	13.50	12.50	13.50	11.00
	44	5220	13.50	13.50	13.50	13.50	13.50	12.50	13.50	12.50
	48	5240	13.50	13.50	13.50	13.50	13.50	12.50	13.50	12.50
Sub Band 2 - 5.3 GHz	52	5260	12.50	12.50	12.50	12.50	12.50	12.50	12.50	12.50
	56	5280	12.50	12.50	12.50	12.50	12.50	12.50	12.50	12.50
	60	5300	12.50	12.50	12.50	12.50	12.50	12.50	12.50	11.00
	64	5320	12.50	12.50	12.00	12.50	10.00	10.50	12.50	8.50
Sub Band 3 - 5.6 GHz	100	5500	12.75	12.75	12.00	12.00	10.00	9.50	10.50	7.50
	104	5520	12.75	12.75	12.75	12.75	12.75	12.75	12.75	10.50
	108	5540	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75
	112	5560	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75
	116	5580	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75
	120	5600	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75
	124	5620	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75
	128	5640	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75
	132	5660	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75
	136	5680	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75
	140	5700	12.50	12.50	12.00	12.50	10.00	10.00	12.50	8.00
	144	5720	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75
Sub Band 4 - 5.8 GHz	149	5745	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75
	153	5765	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75
	157	5785	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75
	161	5805	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75
	165	5825	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75

			Target + Max. Tolerances (dBm) - applicable to all antenna's (Core 0, Core 1 and Core 2)						
Band	Channel (40 MHz BW)	Centre Frequency (MHz)	802.11n HT40 (1 Tx)	802.11n HT40 (2 Tx CDD, non-TXBF)	802.11n HT40 (2 Tx SDM, non-TXBF)	802.11n HT40 (2 Tx, TXBF)	802.11n HT40 (3 Tx CDD, non-TXBF)	802.11n HT40 (3 Tx SDM, non-TXBF)	802.11n HT40 (3 Tx, TXBF)
Sub Band 1 - 5.2 GHz	38	5190	13.50	12.00	12.00	10.00	10.50	11.50	8.50
	46	5230	13.50	13.50	13.50	13.50	13.50	13.50	13.00
Sub Band 2 - 5.3 GHz	54	5270	12.50	12.50	12.50	12.50	12.50	12.50	12.00
	62	5310	12.50	12.00	12.50	10.00	10.50	12.00	8.50
Sub Band 3 - 5.6 GHz	102	5510	12.75	10.00	10.50	8.00	8.00	10.25	6.00
	110	5550	12.75	12.75	12.75	12.75	12.75	12.75	11.00
	118	5590	12.75	12.75	12.75	12.75	12.75	12.75	12.75
	126	5630	12.75	12.75	12.75	12.75	12.75	12.75	12.75
	134	5670	12.75	12.75	12.75	11.00	10.75	12.75	8.75
	142	5710	12.75	12.75	12.75	12.75	12.75	12.75	12.75
Sub Band 4 - 5.8 GHz	151	5755	12.75	12.75	12.75	12.75	12.75	12.75	12.75
	159	5795	12.75	12.75	12.75	12.75	12.75	12.75	12.75

			Target + Max. Tolerances (dBm) - applicable to all antenna's (Core 0, Core 1 and Core 2)						
Band	Channel (80 MHz BW)	Centre Frequency (MHz)	802.11ac VHT80 (1 Tx)	802.11ac VHT80 (2 Tx CDD, non-TXBF)	802.11ac VHT80 (2 Tx SDM, non-TXBF)	802.11ac VHT80 (2 Tx, TXBF)	802.11ac VHT80 (3 Tx CDD, non-TXBF)	802.11ac VHT80 (3 Tx SDM, non-TXBF)	802.11ac VHT80 (3 Tx, TXBF)
Sub Band 1 - 5.2 GHz	42	5210	13.50	11.50	12.00	9.50	10.50	11.00	8.50
Sub Band 2 - 5.3 GHz	58	5290	12.50	9.50	11.50	7.50	9.50	11.50	7.50
Sub Band 3 - 5.6 GHz	106	5530	12.75	10.00	10.50	8.00	7.50	10.00	5.50
	122	5610	12.75	12.75	12.75	12.75	12.75	12.75	12.75
	138	5690	12.75	12.75	12.75	12.75	12.75	12.75	12.75
Sub Band 4 - 5.8 GHz	155	5775	12.75	12.75	12.75	12.75	12.75	12.75	12.75

6.5. Nominal and Maximum Output power: Wi-Fi 2.4 GHz – SDB Mode - Aux Core 2

			Target + Max. Tolerances (dBm)								
Band	Channel	Centre Frequency (MHz)	802.11b (SISO)	802.11g (SISO)	802.11n HT20 (SISO)	802.11n HT20 (2 Tx, DSSS)	802.11n HT20 (2 Tx, non-TXBF)	802.11n HT20 (2 Tx, TXBF)	802.11n HT20 (3 Tx, DSSS)	802.11n HT20 (3 Tx, non-TXBF)	802.11n HT20 (3 Tx, TXBF)
Wi-Fi 2.4GHz	1	2412	18.00	13.50	13.50	NS	NS	NS	NS	NS	NS
	2	2417	18.00	16.00	16.00	NS	NS	NS	NS	NS	NS
	3	2422	18.00	18.00	18.00	NS	NS	NS	NS	NS	NS
	4	2427	18.00	18.00	18.00	NS	NS	NS	NS	NS	NS
	5	2432	18.00	18.00	18.00	NS	NS	NS	NS	NS	NS
	6	2437	18.00	18.00	18.00	NS	NS	NS	NS	NS	NS
	7	2442	18.00	18.00	18.00	NS	NS	NS	NS	NS	NS
	8	2447	18.00	18.00	18.00	NS	NS	NS	NS	NS	NS
	9	2452	18.00	18.00	18.00	NS	NS	NS	NS	NS	NS
	10	2457	18.00	16.00	16.00	NS	NS	NS	NS	NS	NS
	11	2462	18.00	14.00	14.00	NS	NS	NS	NS	NS	NS
	12	2467	18.00	11.50	11.50	NS	NS	NS	NS	NS	NS
	13	2472	13.00	2.50	2.50	NS	NS	NS	NS	NS	NS

NS = Not Supported

6.6. Nominal and Maximum Output power: Wi-Fi 5.0 GHz – SDB Mode - Aux Core 2

			Target + Max. Tolerances (dBm)							
Band	Channel (20 MHz BW)	Center Frequency (MHz)	802.11 a (SISO)	802.11n HT20 (SISO)	802.11n HT20 (2 Tx CDD, non-TXBF)	802.11n HT20 (2 Tx SDM, non-TXBF)	802.11n HT20 (2 Tx, TXBF)	802.11n HT20 (3 Tx CDD, non-TXBF)	802.11n HT20 (3 Tx SDM, non-TXBF)	802.11n HT20 (3 Tx, TXBF)
Sub Band 1 - 5.2 GHz	36	5180	13.50	13.50	NS	NS	NS	NS	NS	NS
	40	5200	13.50	13.50	NS	NS	NS	NS	NS	NS
	44	5220	13.50	13.50	NS	NS	NS	NS	NS	NS
	48	5240	13.50	13.50	NS	NS	NS	NS	NS	NS
Sub Band 2 - 5.3 GHz	52	5260	12.50	12.50	NS	NS	NS	NS	NS	NS
	56	5280	12.50	12.50	NS	NS	NS	NS	NS	NS
	60	5300	12.50	12.50	NS	NS	NS	NS	NS	NS
	64	5320	12.50	12.50	NS	NS	NS	NS	NS	NS
Sub Band 3 - 5.6 GHz	100	5500	12.75	12.75	NS	NS	NS	NS	NS	NS
	104	5520	12.75	12.75	NS	NS	NS	NS	NS	NS
	108	5540	12.75	12.75	NS	NS	NS	NS	NS	NS
	112	5560	12.75	12.75	NS	NS	NS	NS	NS	NS
	116	5580	12.75	12.75	NS	NS	NS	NS	NS	NS
	120	5600	12.75	12.75	NS	NS	NS	NS	NS	NS
	124	5620	12.75	12.75	NS	NS	NS	NS	NS	NS
	128	5640	12.75	12.75	NS	NS	NS	NS	NS	NS
	132	5660	12.75	12.75	NS	NS	NS	NS	NS	NS
	136	5680	12.75	12.75	NS	NS	NS	NS	NS	NS
	140	5700	12.00	12.00	NS	NS	NS	NS	NS	NS
	144	5720	12.75	12.75	NS	NS	NS	NS	NS	NS
Sub Band 4 - 5.8 GHz	149	5745	12.75	12.75	NS	NS	NS	NS	NS	NS
	153	5765	12.75	12.75	NS	NS	NS	NS	NS	NS
	157	5785	12.75	12.75	NS	NS	NS	NS	NS	NS
	161	5805	12.75	12.75	NS	NS	NS	NS	NS	NS
	165	5825	12.75	12.75	NS	NS	NS	NS	NS	NS

			Target + Max. Tolerances (dBm)						
Band	Channel (40 MHz BW)	Centre Frequency (MHz)	802.11n HT40 (1 Tx)	802.11n HT40 (2 Tx CDD, non-TXBF)	802.11n HT40 (2 Tx SDM, non-TXBF)	802.11n HT40 (2 Tx, TXBF)	802.11n HT40 (3 Tx CDD, non-TXBF)	802.11n HT40 (3 Tx SDM, non-TXBF)	802.11n HT40 (3 Tx, TXBF)
Sub Band 1 - 5.2 GHz	38	5190	13.50	NS	NS	NS	NS	NS	NS
	46	5230	13.50	NS	NS	NS	NS	NS	NS
Sub Band 2 - 5.3 GHz	54	5270	12.50	NS	NS	NS	NS	NS	NS
	62	5310	12.50	NS	NS	NS	NS	NS	NS
Sub Band 3 - 5.6 GHz	102	5510	12.75	NS	NS	NS	NS	NS	NS
	110	5550	12.75	NS	NS	NS	NS	NS	NS
	118	5590	12.75	NS	NS	NS	NS	NS	NS
	126	5630	12.75	NS	NS	NS	NS	NS	NS
	134	5670	12.75	NS	NS	NS	NS	NS	NS
	142	5710	12.75	NS	NS	NS	NS	NS	NS
Sub Band 4 - 5.8 GHz	151	5755	12.75	NS	NS	NS	NS	NS	NS
	159	5795	12.75	NS	NS	NS	NS	NS	NS

			Target + Max. Tolerances (dBm)						
Band	Channel (80 MHz BW)	Centre Frequency (MHz)	802.11ac VHT80 (1 Tx)	802.11ac VHT80 (2 Tx CDD, non-TXBF)	802.11ac VHT80 (2 Tx SDM, non-TXBF)	802.11ac VHT80 (2 Tx, TXBF)	802.11ac VHT80 (3 Tx CDD, non-TXBF)	802.11ac VHT80 (3 Tx SDM, non-TXBF)	802.11ac VHT80 (3 Tx, TXBF)
Sub Band 1 - 5.2 GHz	42	5210	13.50	NS	NS	NS	NS	NS	NS
Sub Band 2 - 5.3 GHz	58	5290	12.50	NS	NS	NS	NS	NS	NS
Sub Band 3 - 5.6 GHz	106	5530	12.75	NS	NS	NS	NS	NS	NS
	122	5610	12.75	NS	NS	NS	NS	NS	NS
	138	5690	12.75	NS	NS	NS	NS	NS	NS
Sub Band 4 - 5.8 GHz	155	5775	12.75	NS	NS	NS	NS	NS	NS

NS = Not Supported

7. RF Exposure Conditions (Test Configurations)

7.1. Configuration Consideration

Technology Antenna	Configuration	Antenna-to-User Separation	Position	Antenna-to-Edge Separation (mm)	Evaluation Considered
Core 0 WLAN ~ (Wi-Fi 2.4 GHz/ Wi-Fi 5.0 GHz)	Body	0mm	Back	< 25	Yes
			Right	> 25	No
			Left	> 25	No
			Display Side	< 25	Yes
Core 1 WLAN / WPAN ~ (Wi-Fi 2.4 GHz/ Wi-Fi 5.0 GHz/BT)	Body	0mm	Back	< 25	Yes
			Right	> 25	No
			Left	> 25	No
			Display Side	< 25	Yes
Core 2 WLAN ~ (Wi-Fi 2.4 GHz/ Wi-Fi 5.0 GHz)	Body	0mm	Back	< 25	Yes
			Right	> 25	No
			Left	> 25	No
			Display Side	< 25	Yes

Note: The Antenna to edge separation distances are indicated in the 'Antenna Schematics' located in Section 14.1 of this report.

7.2. SAR Test Exclusion Consideration

Frequency Band	Configuration(s)		
	Body		
	SISO	MIMO	
		2x2	3x3
WLAN 2.4 GHz	No	No	No
WLAN 5.2 GHz (U-NII-1)	No	No	No
WLAN 5.3 GHz (U-NII-2A)	Yes[1]	Yes[1]	Yes[1]
WLAN 5.6 GHz (U-NII-2C)	No	No	No
WLAN 5.8 GHz (U-NII-3)	No	No	No
Bluetooth	No	Not Supported	Not Supported

Note: As per KDB 248227, U-NII-1 was chosen for SAR evaluation as maximum rated power for U-NII-1 > U-NII-2A. Based on the measurements obtained, SAR measurements on U-NII-2A band are not required as highest reported SAR from U-NII-1 band is ≤ 1.2 W/Kg.

8. Conducted Output Power Measurements

8.1. RF Output Average Power Measurement: Wi-Fi 2.4 GHz

Note:

1. Additional Conducted power measurements are performed on adjacent Channels having same or higher Max. rated power than the standard Channels (i.e., 1, 6, and 11).

8.1.1. Wi-Fi 2.4 GHz – SISO

		Avg Power (dBm)			
		Core 0	Core 1	Core 2	
Channel Number	Frequency (MHz)	6Mbps	6Mbps	6Mbps	Operating Mode
1	2412	17.60	17.60	17.60	802.11b DSSS
6	2437	17.80	17.90	17.90	
11	2462	17.50	17.70	17.50	
12	2467	13.50	13.90	13.80	
13	2472	12.60	12.90	12.90	

Note: Conducted power measurements for 802.11g and 802.11n HT20 modes not required, as the Max. Rated Power for these mode was ≤ 802.11b mode

8.1.2. Wi-Fi 2.4 GHz – MIMO 2x2

			Avg Power (dBm)		
		Core 0	Core 1	Core 2	
Channel Number	Frequency (MHz)	6.5Mbps	6.5Mbps	6.5Mbps	Operating Mode
1	2412	17.70	17.60		802.11n, HT20 OFDM
6	2437	18.00	17.80		
11	2462	17.90	17.70		
12	2467	13.50	13.10		
13	2472	10.80	10.40		
1	2412	17.70		17.70	
6	2437	18.00		17.80	
11	2462	17.80		17.60	
12	2467	13.60		13.40	
13	2472	10.70		10.30	
1	2412		17.50	17.40	
6	2437		17.60	17.60	
11	2462		17.50	17.40	
12	2467		13.00	12.90	
13	2472		10.40	10.30	

8.1.3. Wi-Fi 2.4 GHz – MIMO 3x3

		Avg Power (dBm)			
		Core 0	Core 1	Core 2	
Channel Number	Frequency (MHz)	6.5Mbps	6.5Mbps	6.5Mbps	Operating Mode
1	2412	17.10	16.80	17.00	802.11n, HT20 OFDM
2	2417	17.80	17.20	17.50	
6	2437	17.60	17.50	17.30	
10	2457	17.40	17.20	17.20	
11	2462	16.60	16.30	16.20	
12	2467	13.40	13.20	13.10	
13	2472	9.90	9.30	9.30	

8.2. RF Output Average Power Measurement: Wi-Fi 5.0GHz

Note:

1. When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11a/n/ac modes, the channel in the lower order/sequence 802.11 mode (i.e. a, n then ac) is selected.
2. For the cases where the power are not flat throughout the modes, additional power measurements were also performed on the next highest bandwidth provided the power response was identical. This was performed in order to assess the SAR response throughout the frequency band and established that all worst cases have been evaluated.

8.2.1. Wi-Fi 5.2 GHz U-NII-1 – SISO

		Avg Power (dBm)			
		Core 0	Core 1	Core 2	
Channel Number	Frequency (MHz)	29.3 Mbps	29.3 Mbps	29.3 Mbps	Operating Mode
42	5210	13.20	13.10	13.00	802.11ac VHT80

8.2.2. Wi-Fi 5.2 GHz U-NII-1 – MIMO 2x2

			Avg Power (dBm)		
		Core 0	Core 1	Core 2	
Channel Number	Frequency (MHz)	6 Mbps	6 Mbps	6 Mbps	Operating Mode
36	5180	13.20	12.90		802.11n HT20
40	5200	13.20	12.90		
44	5220	13.40	12.90		
48	5240	13.20	12.90		
36	5180	13.30		13.10	
40	5200	13.30		13.00	
44	5220	13.20		13.10	
48	5240	13.20		13.00	
36	5180		13.10	13.00	
40	5200		13.00	13.00	
44	5220		13.00	13.00	
48	5240		12.90	13.00	
Channel Number	Frequency (MHz)	13.5 Mbps	13.5 Mbps	13.5 Mbps	Operating Mode
38	5190	11.80	11.30		802.11n HT40
46	5230	13.10	12.90		
38	5190	11.50		11.20	
46	5230	13.20		13.00	
38	5190		11.70	11.60	
46	5230		13.00	12.90	

8.2.3. Wi-Fi 5.2 GHz U-NII-1 – MIMO 3x3

		Avg Power (dBm)			
		Core 0	Core 1	Core 2	
Channel Number	Frequency (MHz)	6 Mbps	6 Mbps	6 Mbps	Operating Mode
36	5180	13.50	12.90	13.00	802.11n HT20
40	5200	13.00	12.80	12.80	
44	5220	13.30	12.90	13.10	
48	5240	13.20	12.90	13.00	
Channel Number	Frequency (MHz)	13.5 Mbps	13.5 Mbps	13.5 Mbps	Operating Mode
38	5190	11.30	10.90	10.90	802.11n HT40
46	5230	11.60	11.60	11.30	

8.2.4. Wi-Fi 5.3 GHz U-NII-2A – SISO

		Avg Power (dBm)			
		Core 0	Core 1	Core 2	
Channel Number	Frequency (MHz)	29.3 Mbps	29.3 Mbps	29.3 Mbps	Operating Mode
58	5290	12.30	12.20	12.20	802.11ac VHT80

8.2.5. Wi-Fi 5.3 GHz U-NII-2A – MIMO 2x2

		Avg Power (dBm)			
		Core 0	Core 1	Core 2	
Channel Number	Frequency (MHz)	13.5 Mbps	13.5 Mbps	13.5 Mbps	Operating Mode
54	5270	12.20	12.00		802.11n HT40
62	5310	12.10	11.90		
54	5270	12.20		11.90	
62	5310	12.10		11.90	
54	5270		12.00	11.90	
62	5310		11.90	12.00	

8.2.6. Wi-Fi 5.3 GHz U-NII-2A – MIMO 3x3

		Avg Power (dBm)			
		Core 0	Core 1	Core 2	
Channel Number	Frequency (MHz)	6 Mbps	6 Mbps	6 Mbps	Operating Mode
52	5260	12.50	12.20	12.00	802.11n HT20
56	5280	12.30	12.20	12.00	
60	5300	12.40	12.00	12.10	
64	5320	12.40	14.10	12.10	

8.2.7. Wi-Fi 5.6 GHz U-NII-2C – SISO

		Avg Power (dBm)			
		Core 0	Core 1	Core 2	
Channel Number	Frequency (MHz)	29.3 Mbps	29.3 Mbps	29.3 Mbps	Operating Mode
106	5530	12.60	12.70	12.20	802.11ac VHT80
122	5610	12.60	12.60	12.50	
138	5690	12.50	12.40	12.30	

8.2.8. Wi-Fi 5.6 GHz U-NII-2C – MIMO 2x2

			Avg Power (dBm)		
		Core 0	Core 1	Core 2	
Channel Number	Frequency (MHz)	13.5 Mbps	13.5 Mbps	13.5 Mbps	Operating Mode
102	5510	10.30	10.00		802.11n HT40
110	5550	12.30	12.30		
118	5590	12.10	12.30		
126	5630	12.70	12.70		
134	5670	12.70	12.60		
142	5710	12.70	12.60		
102	5510	10.20		10.20	
110	5550	12.30		12.40	
118	5590	12.40		12.50	
126	5630	12.50		12.60	
134	5670	12.50		12.60	
142	5710	12.70		12.60	
102	5510		9.90	10.10	
110	5550		12.20	12.30	
118	5590		12.30	12.20	
126	5630		12.50	12.60	
134	5670		12.70	12.40	
142	5710		12.60	12.60	
Channel Number	Frequency (MHz)	29.3 Mbps	29.3 Mbps	29.3 Mbps	Operating Mode
106	5530	10.40	10.00		802.11ac VHT80
122	5610	12.40	12.60		
138	5690	12.60	12.50		
106	5530	10.00		10.00	
122	5610	12.50		12.60	
138	5690	12.60		12.40	
106	5530		10.00	10.00	
122	5610		12.70	12.60	
138	5690		12.60	12.50	

8.2.9. Wi-Fi 5.6 GHz U-NII-2C – MIMO 3x3

		Avg Power (dBm)			
		Core 0	Core 1	Core 2	
Channel Number	Frequency (MHz)	13.5 Mbps	13.5 Mbps	13.5 Mbps	Operating Mode
102	5510	9.70	9.70	9.90	802.11n HT40
110	5550	12.30	11.90	12.30	
118	5590	12.30	11.80	11.90	
126	5630	12.60	12.20	12.50	
134	5670	12.50	12.40	12.30	
142	5710	12.60	12.60	12.50	
Channel Number	Frequency (MHz)	29.3 Mbps	29.3 Mbps	29.3 Mbps	Operating Mode
106	5530	9.90	10.00	9.90	802.11ac VHT80
122	5610	12.60	12.70	12.60	
138	5690	12.60	12.70	12.50	

8.2.10. Wi-Fi 5.8 GHz U-NII-3 – SISO

		Avg Power (dBm)			
		Core 0	Core 1	Core 2	
Channel Number	Frequency (MHz)	29.3 Mbps	29.3 Mbps	29.3 Mbps	Operating Mode
155	5775	12.50	12.60	12.70	802.11ac VHT80

8.2.11. Wi-Fi 5.8 GHz U-NII-3 – MIMO 2x2

			Avg Power (dBm)		
		Core 0	Core 1	Core 2	
Channel Number	Frequency (MHz)	29.3 Mbps	29.3 Mbps	29.3 Mbps	Operating Mode
155	5775	12.40	12.60		802.11ac VHT80
155	5775	12.50		12.30	
155	5775		12.60	12.30	

8.2.12. Wi-Fi 5.8 GHz U-NII-3 – MIMO 3X3

		Avg Power (dBm)			
		Core 0	Core 1	Core 2	
Channel Number	Frequency (MHz)	29.3 Mbps	29.3 Mbps	29.3 Mbps	Operating Mode
155	5775	12.10	12.60	12.10	802.11ac VHT80

8.3. RF Output Average Power Measurement: Wi-Fi SDB Mode

Simultaneous Dual Band (SDB) mode allows antenna Core 2 to simultaneously transmit on 2 different bands (2.4GHz and 5GHz) using the same antenna, since this one contains two cores, Main and Auxiliary. One band will transmit using the Main core and the other uses the Auxiliary core.

When this mode is enabled, the Auxiliary core is set to transmit at “SDB Mode Aux Core” standard power rate (Section 6) and the Main core set to transmit at a lower rate.

When the SDB mode is active, Core 2 Auxiliary core can also transmit along with Core 0 and Core 1. For these cases, all the antennas are set to the standard power rate.

8.3.1. Wi-Fi 802.11b (2.4 GHz) – SDB Mode Main Core (Low Power Rate)

		Avg Power (dBm)	
		Core 2	
Channel Number	Frequency (MHz)	6 Mbps	Operating Mode
1	2412	10.70	802.11b
6	2437	10.80	
11	2462	10.70	
12	2467	10.60	
13	2472	10.60	

8.3.2. Wi-Fi 802.11a/n/ac (5.0 GHz) – SDB Mode Main Core (Low Power Rate)

		Avg Power (dBm)	
		Core 2	
Channel Number	Frequency (MHz)	29.3 Mbps	Operating Mode
42	5210	6.50	802.11ac VHT80
58	5290	5.50	
106	5530	5.75	
122	5610	5.75	
138	5690	5.75	
155	5775	5.75	

8.3.3. Wi-Fi 802.11b (2.4 GHz) – SDB Mode Aux Core (Standard Power Rate)

		Avg Power (dBm)	
		Core 2	
Channel Number	Frequency (MHz)	6 Mbps	Operating Mode
1	2412	17.60	802.11b
6	2437	17.90	
11	2462	17.50	
12	2467	17.50	
13	2472	12.90	

8.3.4. Wi-Fi 802.11a/n/ac (5.0 GHz) – SDB Mode Aux Core (Standard Power Rate)

		Avg Power (dBm)	
		Core 2	
Channel Number	Frequency (MHz)	29.3 Mbps	Operating Mode
42	5210	13.00	802.11ac VHT80
58	5290	12.20	
106	5530	12.50	
122	5610	12.30	
138	5690	12.30	
155	5775	12.40	

8.4. RF Output Average Power Measurement: Bluetooth

		Avg Power (dBm)	
Channel Number	**Frequency (MHz)**	**Core 1**	**Operating Mode**
0	2402	12.80	**BDR (GFSK DH5)**
39	2441	13.00	
78	2480	13.00	

9. Dielectric Property Measurements & System Check

9.1.Tissue Dielectric Parameters

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.
The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.
Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

IEEE 1528:2013

Target Frequency (MHz)	Head		Body (FCC only)	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.30	0.76	61.90	0.80
300	45.30	0.87	58.20	0.92
450	43.50	0.87	56.70	0.94
750	41.90	0.89	-	-
835	41.50	0.90	55.20	0.97
900	41.50	0.97	55.00	1.05
915	41.50	0.98	55.00	1.06
1450	40.50	1.20	54.00	1.30
1500	40.40	1.23	-	-
1610	40.30	1.29	53.80	1.40
1640	40.20	1.31	-	-
1750	40.10	1.37	-	-
1800	40.00	1.40	53.30	1.52
1900	40.00	1.40	53.30	1.52
2000	40.00	1.40	53.30	1.52
2100	39.80	1.49	-	-
2300	39.50	1.67	-	-
2450	39.20	1.80	52.70	1.95
2600	39.00	1.96	-	-
3000	38.50	2.40	52.00	2.73
3500	37.90	2.91	-	-
4000	37.40	3.43	-	-
4500	36.80	3.94	-	-
5000	36.20	4.45	49.30	5.07
5100	36.10	4.55	49.10	5.18
5200	36.00	4.66	49.00	5.30
5250	35.90	4.71	48.90	5.36
5300	35.90	4.76	48.90	5.42
5400	35.80	4.86	48.70	5.53
5500	35.60	4.96	48.60	5.65
5600	35.50	5.07	48.50	5.77
5700	35.40	5.17	48.30	5.88
5750	35.40	5.22	48.30	5.94
5800	35.30	5.27	48.20	6.00
6000	35.10	5.48	-	-

NOTE: For convenience, permittivity and conductivity values at some frequencies that are not part of the original data from Drossos et al. [B60] or the extension to 5800 MHz are provided (i.e., the values shown in italics). These values were linearly interpolated between the values in this table that are immediately above and below these values, except the values at 6000 MHz that were linearly extrapolated from the values at 3000 MHz and 5800 MHz.

9.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

9.3. Reference Target SAR Values

The reference SAR values are obtained from the calibration certificate of system validation dipoles. The measured values are normalised to 1 Watt.

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Numerical SAR Target Values (W/kg)	
				1g/10g	Head
D2450V2	725	08 Oct 2019	2450	1g	52.40
				10g	24.00
D5GHzV2	1222	11 Oct 2019	5250	1g	77.40
				10g	21.90
			5600	1g	80.10
				10g	22.50
			5750	1g	77.00
				10g	21.60

9.4. Dielectric Property Measurements & System Check Results

The 1-g SAR and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within ±10% of the manufacturer calibrated dipole SAR target. The internal limit is set to ±10%.

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System check 2450 Head

Date: 05/12/2019

Validation dipole and Serial Number: D2450V2 / SN: 725

Simulant	Frequency (MHz)	Room Temp (℃)	Liquid Temp (℃)	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	2450	22.2	22.2	εr	39.20	39.49	0.75	10.00
				Σ	1.80	1.82	1.35	10.00
				1g (W/kg)	52.40	51.87	-0.99	10.00
				10g (W/kg)	24.00	23.94	-0.23	10.00

System check 5250 Head

Date: 03/12/2019

Validation dipole and Serial Number: D5GHzv2 / SN: 1222

Simulant	Frequency (MHz)	Room Temp (℃)	Liquid Temp (℃)	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	5250	22.2	22.2	εr	35.90	34.76	-3.19	10.00
				Σ	4.71	4.48	-4.90	10.00
				1g (W/kg)	77.40	82.00	5.94	10.00
				10g (W/kg)	21.90	23.74	8.41	10.00

Date: 06/12/2019

Validation dipole and Serial Number: D5GHzv2 / SN: 1222

Simulant	Frequency (MHz)	Room Temp (℃)	Liquid Temp (℃)	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	5250	20.5	20.2	εr	35.90	35.90	0.01	10.00
				Σ	4.71	4.61	-2.15	10.00
				1g (W/kg)	77.40	77.23	-0.21	10.00
				10g (W/kg)	21.90	22.17	1.25	10.00

System check 5600 Head

Date: 09/12/2019

Validation dipole and Serial Number: D5GHzv2 / SN: 1222

Simulant	Frequency (MHz)	Room Temp (℃)	Liquid Temp (℃)	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	5600	21.9	21.6	εr	35.50	34.67	-2.34	10.00
				Σ	5.07	5.05	-0.37	10.00
				1g (W/kg)	80.10	80.80	0.87	10.00
				10g (W/kg)	22.50	22.80	1.33	10.00

Site 61

System check 2450 Head

Date: 02/12/2019

Validation dipole and Serial Number: D2450V2 / SN: 725

Simulant	Frequency (MHz)	Room Temp (℃)	Liquid Temp (℃)	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	2450	20.0	20.8	εr	39.20	39.55	0.89	10.00
				Σ	1.80	1.83	1.62	10.00
				1g (W/kg)	52.40	53.47	2.04	10.00
				10g (W/kg)	24.00	24.74	3.08	10.00

System check 5750 Head

Date: 05/12/2019

Validation dipole and Serial Number: D5GHzv2 / SN: 1222

Simulant	Frequency (MHz)	Room Temp (℃)	Liquid Temp (℃)	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	5750	22.8	22.5	εr	35.40	35.15	-0.70	10.00
				Σ	5.22	5.00	-4.26	10.00
				1g (W/kg)	77.00	82.40	7.01	10.00
				10g (W/kg)	21.60	23.50	8.79	10.00

10. Measurements, Examinations and Derived Results

10.1. General Comments

In the 2.4 GHz band, separate SAR procedures were applied to DSSS and OFDM configurations to simplify DSSS test requirements. SAR test was evaluated on the mode with the highest rated power, which is in this case was 802.11b mode. OFDM mode was not evaluated because when the highest reported SAR for DSSS was adjusted by the ratio of OFDM to DSSS specified maximum output power, the adjusted SAR obtained was < 1.2W/kg.

In the 5.0 GHz band, the initial test configuration transmission mode was determined by the 802.11 configuration with the highest maximum output power specified for production units, including upper tune-up tolerance, in each standalone and aggregated frequency band. Since multiple channel bandwidth configuration modes have the same specified maximum output power, SAR test was performed on the largest channel bandwidth with the lowest order modulation.

For the cases where the power was not flat throughout the modes to test, additional runs were also performed on the next highest bandwidth provided the power response was identical. This was performed in order to assess the SAR response throughout the frequency band and established that all worst cases have been evaluated.

Notes:

1. SAR Values represented by "-" indicate no SAR peaks were detected during area scans.
2. Effective 19th February 2019, the FCC has permitted the use of the head-tissue simulating liquid specified in IEC 62209-1 for all SAR tests – "RF Exposure Procedures" TCB Presentation April 2019.
3. As per KDB 248227, U-NII-1 was chosen for SAR evaluation as maximum rated power for U-NII-1 > U-NII-2A. Based on the measurements obtained, SAR measurements on U-NII-2A band are not required as highest reported SAR from U-NII-1 band is ≤ 1.2 W/Kg.

10.2. Specific Absorption Rate - Test Results - WiFi

10.2.1. WLAN 2.4GHz Body 1g - SISO

Max Reported SAR = 0.95 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	Dist. (mm)	EUT Position	CH #	Freq (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Transmitting Antenna	Notes	Plot No.
Core 0											
802.11b	0	Back	6	2437.0	18.00	17.90	0.82	0.84	Core 0	-	-
802.11b	0	Back	1	2412.0	18.00	17.60	0.80	0.88	Core 0	-	-
802.11b	0	Back	11	2462.0	18.00	17.70	0.88	0.95	Core 0	-	001
802.11b	0	Display	6	2437.0	18.00	17.90	0.09	0.09	Core 0	-	-
Core 1											
802.11b	0	Back	6	2437.0	18.00	17.80	0.71	0.74	Core 1	-	-
802.11b	0	Display	6	2437.0	18.00	17.80	0.07	0.07	Core 1	-	-
Core 2											
802.11b	0	Back	6	2437.0	18.00	17.90	0.76	0.78	Core 2	-	-
802.11b	0	Display	6	2437.0	18.00	17.90	0.06	0.06	Core 2	-	-

Note(s):

10.2.2. WLAN 2.4GHz Body 1g - MIMO

Max Reported SAR = 1.04 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	Dist. (mm)	EUT Position	CH #	Freq (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Transmitting Antenna	Notes	Plot No.
Core 0 + Core 1											
802.11n HT20	0	Back	6	2437.0	18.00	18.00	0.93	0.93	Core 0	-	-
802.11n HT20	0	Back	6	2437.0	18.00	17.80	0.79	0.83	Core 1	-	-
802.11n HT20	0	Back	1	2412.0	18.00	17.70	0.90	0.96	Core 0	-	-
802.11n HT20	0	Back	1	2412.0	18.00	17.60	0.78	0.86	Core 1	-	-
802.11n HT20	0	Back	11	2462.0	18.00	17.90	0.87	0.89	Core 0	-	-
802.11n HT20	0	Back	11	2462.0	18.00	17.70	0.73	0.78	Core 1	-	-
Core 1 + Core 2											
802.11n HT20	0	Back	6	2437.0	18.00	17.60	0.70	0.77	Core 1	-	-
802.11n HT20	0	Back	6	2437.0	18.00	17.60	0.66	0.72	Core 2	-	-
Core 2 + Core 0											
802.11n HT20	0	Back	6	2437.0	18.00	17.80	0.80	0.84	Core 2	-	002
802.11n HT20	0	Back	6	2437.0	18.00	18.00	1.04	1.04	Core 0	-	
802.11n HT20	0	Back	1	2412.0	18.00	17.70	0.81	0.86	Core 2	-	-
802.11n HT20	0	Back	1	2412.0	18.00	17.70	0.73	0.78	Core 0	-	-
802.11n HT20	0	Back	11	2462.0	18.00	17.60	0.60	0.66	Core 2	-	-
802.11n HT20	0	Back	11	2462.0	18.00	17.80	0.81	0.85	Core 0	-	-
Core 0 + Core 1 + Core 2											
802.11n HT20	0	Back	2	2417.0	18.00	17.80	0.71	0.74	Core 0	-	-
802.11n HT20	0	Back	2	2417.0	18.00	17.20	0.66	0.80	Core 1	-	-
802.11n HT20	0	Back	2	2417.0	18.00	17.50	0.59	0.66	Core 2	-	-
802.11n HT20	0	Back	6	2437.0	18.00	17.60	0.83	0.91	Core 0	-	003
802.11n HT20	0	Back	6	2437.0	18.00	17.50	0.63	0.70	Core 1	-	
802.11n HT20	0	Back	6	2437.0	18.00	17.30	0.63	0.74	Core 2	-	
802.11n HT20	0	Back	10	2457.0	18.00	17.40	0.78	0.89	Core 0	-	-
802.11n HT20	0	Back	10	2457.0	18.00	17.40	0.62	0.71	Core 1	-	-
802.11n HT20	0	Back	10	2457.0	18.00	17.20	0.57	0.69	Core 2	-	-

Note(s):

10.2.3. WLAN 5.2GHz Body 1g - SISO

Max Reported SAR = 1.03 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	Dist. (mm)	EUT Position	CH #	Freq (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Transmitting Antenna	Notes	Plot No.
Core 0											
802.11ac VHT80	0	Back	42	5210.0	13.50	13.20	0.90	0.96	Core 0	-	-
802.11ac VHT80	0	Display	42	5210.0	13.50	13.20	0.14	0.15	Core 0	-	-
Core 1											
802.11ac VHT80	0	Back	42	5210.0	13.50	13.10	0.94	1.03	Core 1	-	004
802.11ac VHT80	0	Display	42	5210.0	13.50	13.10	0.16	0.18	Core 1	-	-
Core 2											
802.11ac VHT80	0	Back	42	5210.0	13.50	13.00	0.81	0.91	Core 2	-	-
802.11ac VHT80	0	Display	42	5210.0	13.50	13.00	0.19	0.21	Core 2	-	-

Note(s):

10.2.5. WLAN 5.2GHz Body 1g - MIMO
Max Reported SAR = 0.96 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	Dist. (mm)	EUT Position	CH #	Freq (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Transmitting Antenna	Notes	Plot No.
Core 0 + Core 1											
802.11n HT40	0	Back	46	5230.0	13.50	13.10	0.82	0.90	Core 0	-	-
802.11n HT40	0	Back	46	5230.0	13.50	12.90	0.76	0.87	Core 1	-	-
802.11n HT40	0	Back	38	5190.0	12.00	11.80	0.57	0.59	Core 0	-	-
802.11n HT40	0	Back	38	5190.0	12.00	11.30	0.57	0.67	Core 1	-	-
802.11n HT20	0	Back	44	5220.0	13.50	13.40	0.89	0.91	Core 0	-	-
802.11n HT20	0	Back	44	5220.0	13.50	12.90	0.72	0.82	Core 1	-	-
802.11n HT20	0	Back	36	5180.0	13.50	13.20	0.83	0.89	Core 0	-	-
802.11n HT20	0	Back	36	5180.0	13.50	12.90	0.82	0.94	Core 1	-	-
802.11n HT20	0	Back	48	5240.0	13.50	13.20	0.88	0.95	Core 0	-	-
802.11n HT20	0	Back	48	5240.0	13.50	12.90	0.77	0.89	Core 1	-	-
Core 1 + Core 2											
802.11n HT40	0	Back	46	5230.0	13.50	13.00	0.76	0.85	Core 1	-	-
802.11n HT40	0	Back	46	5230.0	13.50	12.90	0.69	0.80	Core 2	-	-
802.11n HT40	0	Back	38	5190.0	12.00	11.70	0.66	0.70	Core 1	-	-
802.11n HT40	0	Back	38	5190.0	12.00	11.60	0.51	0.56	Core 2	-	-
802.11n HT20	0	Back	36	5180.0	13.50	13.10	0.84	0.92	Core 1	-	-
802.11n HT20	0	Back	36	5180.0	13.50	13.00	0.69	0.77	Core 2	-	-
802.11n HT20	0	Back	40	5200.0	13.50	13.00	0.77	0.86	Core 1	-	-
802.11n HT20	0	Back	40	5200.0	13.50	13.00	0.67	0.76	Core 2	-	-
802.11n HT20	0	Back	44	5220.0	13.50	13.00	0.78	0.88	Core 1	-	-
802.11n HT20	0	Back	44	5220.0	13.50	13.00	0.69	0.77	Core 2	-	-
Core 2 + Core 0											
802.11n HT40	0	Back	46	5230.0	13.50	13.00	0.63	0.70	Core 2	-	-
802.11n HT40	0	Back	46	5230.0	13.50	13.20	0.85	0.92	Core 0	-	-
802.11n HT40	0	Back	38	5190.0	12.00	11.50	0.42	0.47	Core 2	-	-
802.11n HT40	0	Back	38	5190.0	12.00	11.20	0.55	0.66	Core 0	-	-
802.11n HT20	0	Back	36	5180.0	13.50	13.10	0.68	0.75	Core 2	-	-
802.11n HT20	0	Back	36	5180.0	13.50	13.30	0.87	0.91	Core 0	-	-
802.11n HT20	0	Back	40	5200.0	13.50	13.00	0.65	0.72	Core 2	-	-
802.11n HT20	0	Back	40	5200.0	13.50	13.30	0.83	0.87	Core 0	-	-
802.11n HT20	0	Back	48	5240.0	13.50	13.00	0.63	0.71	Core 2	-	005
802.11n HT20	0	Back	48	5240.0	13.50	13.20	0.89	0.95	Core 0	-	
Core 0 + Core 1 + Core 2											
802.11n HT40	0	Back	46	5230.0	13.50	11.75	0.59	0.89	Core 0	-	-
802.11n HT40	0	Back	46	5230.0	13.50	11.75	0.54	0.81	Core 1	-	-
802.11n HT40	0	Back	46	5230.0	13.50	11.50	0.41	0.64	Core 2	-	-
802.11n HT40	0	Back	38	5190.0	11.50	11.30	0.54	0.57	Core 0	-	-
802.11n HT40	0	Back	38	5190.0	11.50	10.90	0.51	0.58	Core 1	-	-
802.11n HT40	0	Back	38	5190.0	11.50	10.90	0.39	0.45	Core 2	-	-
802.11n HT20	0	Back	36	5180.0	13.50	13.50	0.87	0.87	Core 0	-	-
802.11n HT20	0	Back	36	5180.0	13.50	12.90	0.82	0.94	Core 1	-	-
802.11n HT20	0	Back	36	5180.0	13.50	13.00	0.63	0.70	Core 2	-	-
802.11n HT20	0	Back	44	5220.0	13.50	13.30	0.87	0.91	Core 0	-	-
802.11n HT20	0	Back	44	5220.0	13.50	12.90	0.78	0.90	Core 1	-	-
802.11n HT20	0	Back	44	5220.0	13.50	13.10	0.62	0.68	Core 2	-	-
802.11n HT20	0	Back	48	5240.0	13.50	13.20	0.90	0.96	Core 0	-	006
802.11n HT20	0	Back	48	5240.0	13.50	12.90	0.74	0.86	Core 1	-	
802.11n HT20	0	Back	48	5240.0	13.50	13.00	0.63	0.70	Core 2	-	

Note(s):

10.2.4. WLAN 5.6GHz Body 1g - SISO

Max Reported SAR = 0.89 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	Dist. (mm)	EUT Position	CH #	Freq (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Transmitting Antenna	Notes	Plot No.
Core 0											
802.11ac VHT80	0	Back	106	5530.0	12.75	12.60	0.71	0.74	Core 0	-	-
802.11ac VHT80	0	Back	122	5610.0	12.75	12.60	0.68	0.70	Core 0	-	-
802.11ac VHT80	0	Back	138	5690.0	12.75	12.50	0.52	0.55	Core 0	-	-
Core 1											
802.11ac VHT80	0	Back	106	5530.0	12.75	12.70	0.77	0.78	Core 1	-	-
802.11ac VHT80	0	Back	122	5610.0	12.75	12.60	0.82	0.85	Core 1	-	-
802.11ac VHT80	0	Back	138	5690.0	12.75	12.40	0.82	0.89	Core 1	-	007
Core 2											
802.11ac VHT80	0	Back	106	5530.0	12.75	12.50	0.69	0.74	Core 2	-	-

Note(s):

10.2.5. WLAN 5.6GHz Body 1g - MIMO
Max Reported SAR = 1.00 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	Dist. (mm)	EUT Position	CH #	Freq (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Transmitting Antenna	Notes	Plot No.
Core 0 + Core 1											
802.11ac VHT80	0	Back	138	5690.0	12.75	12.60	0.49	0.51	Core 0	-	-
802.11ac VHT80	0	Back	138	5690.0	12.75	12.50	0.82	0.86	Core 1	-	-
802.11ac VHT80	0	Back	106	5530.0	10.50	10.40	0.43	0.44	Core 0	-	-
802.11ac VHT80	0	Back	106	5530.0	10.50	10.00	0.44	0.49	Core 1	-	-
802.11ac VHT80	0	Back	122	5610.0	12.75	12.60	0.77	0.80	Core 0	-	008
802.11ac VHT80	0	Back	122	5610.0	12.75	12.50	0.93	0.98	Core 1	-	
802.11n HT40	0	Back	126	5630.0	12.75	12.70	0.62	0.62	Core 0	-	-
802.11n HT40	0	Back	126	5630.0	12.75	12.70	0.77	0.78	Core 1	-	-
Core 1 + Core 2											
802.11ac VHT80	0	Back	122	5610.0	12.75	12.70	0.81	0.82	Core 1	-	-
802.11ac VHT80	0	Back	122	5610.0	12.75	12.60	0.62	0.64	Core 2	-	-
802.11ac VHT80	0	Back	106	5530.0	10.50	10.00	0.43	0.49	Core 1	-	-
802.11ac VHT80	0	Back	106	5530.0	10.50	10.00	0.37	0.41	Core 2	-	-
802.11ac VHT80	0	Back	138	5690.0	12.75	12.50	0.88	0.93	Core 1	-	-
802.11ac VHT80	0	Back	138	5690.0	12.75	12.60	0.55	0.57	Core 2	-	-
802.11n HT40	0	Back	134	5670.0	12.75	12.70	0.92	0.93	Core 1	-	-
802.11n HT40	0	Back	134	5670.0	12.75	12.40	0.59	0.64	Core 2	-	-
802.11n HT40	0	Back	110	5550.0	12.75	12.20	0.78	0.88	Core 1	-	-
802.11n HT40	0	Back	110	5550.0	12.75	12.30	0.68	0.76	Core 2	-	-
802.11n HT40	0	Back	142	5710.0	12.75	12.60	0.93	0.96	Core 1	-	-
802.11n HT40	0	Back	142	5710.0	12.75	12.60	0.59	0.61	Core 2	-	-
Core 2 + Core 0											
802.11ac VHT80	0	Back	122	5610.0	12.75	12.60	0.57	0.59	Core 2	-	-
802.11ac VHT80	0	Back	122	5610.0	12.75	12.50	0.65	0.68	Core 0	-	-
802.11n HT40	0	Back	142	5710.0	12.75	12.60	0.63	0.65	Core 2	-	-
802.11n HT40	0	Back	142	5710.0	12.75	12.70	0.60	0.61	Core 0	-	-
Core 0 + Core 1 + Core 2											
802.11ac VHT80	0	Back	122	5610.0	12.75	12.60	0.66	0.69	Core 0	-	-
802.11ac VHT80	0	Back	122	5610.0	12.75	12.70	0.83	0.84	Core 1	-	-
802.11ac VHT80	0	Back	122	5610.0	12.75	12.60	0.56	0.57	Core 2	-	-
802.11ac VHT80	0	Back	106	5530.0	10.00	9.90	0.40	0.41	Core 0	-	-
802.11ac VHT80	0	Back	106	5530.0	10.00	10.00	0.40	0.40	Core 1	-	-
802.11ac VHT80	0	Back	106	5530.0	10.00	9.90	0.35	0.36	Core 2	-	-
802.11ac VHT80	0	Back	138	5690.0	12.75	12.60	0.59	0.61	Core 0	-	-
802.11ac VHT80	0	Back	138	5690.0	12.75	12.70	0.92	0.93	Core 1	-	-
802.11ac VHT80	0	Back	138	5690.0	12.75	12.50	0.59	0.62	Core 2	-	-
802.11n HT40	0	Back	142	5710.0	12.75	12.60	0.63	0.65	Core 0	-	-
802.11n HT40	0	Back	142	5710.0	12.75	12.60	0.93	0.96	Core 1	-	-
802.11n HT40	0	Back	142	5710.0	12.75	12.50	0.62	0.66	Core 2	-	-
802.11n HT40	0	Back	110	5550.0	12.75	11.90	0.82	1.00	Core 0	-	009
802.11n HT40	0	Back	110	5550.0	12.75	12.30	0.79	0.88	Core 1	-	
802.11n HT40	0	Back	110	5550.0	12.75	12.30	0.67	0.74	Core 2	-	
802.11n HT40	0	Back	126	5630.0	12.75	12.20	0.74	0.84	Core 0	-	-
802.11n HT40	0	Back	126	5630.0	12.75	12.60	0.89	0.92	Core 1	-	-
802.11n HT40	0	Back	126	5630.0	12.75	12.50	0.62	0.66	Core 2	-	-

Note(s):

10.2.6. WLAN 5.8GHz Body 1g - SISO

Max Reported SAR = 0.88 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	Dist. (mm)	EUT Position	CH #	Freq (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Transmitting Antenna	Notes	Plot No.
Core 0											
802.11ac VHT80	0	Back	155	5775.0	12.75	12.50	0.50	0.52	Core 0	-	-
Core 1											
802.11ac VHT80	0	Back	155	5775.0	12.75	12.60	0.85	0.88	Core 1	-	010
Core 2											
802.11ac VHT80	0	Back	155	5775.0	12.75	12.70	0.79	0.80	Core 2	-	-

Note(s):

10.2.7. WLAN 5.8GHz Body 1g - MIMO

Max Reported SAR = 1.00 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	Dist. (mm)	EUT Position	CH #	Freq (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Transmitting Antenna	Notes	Plot No.
Core 0 + Core 1											
802.11ac VHT80	0	Back	155	5775.0	12.75	12.40	0.58	0.63	Core 0	-	-
802.11ac VHT80	0	Back	155	5775.0	12.75	12.60	0.96	0.99	Core 1	-	-
Core 1 + Core 2											
802.11ac VHT80	0	Back	155	5775.0	12.75	12.60	0.97	1.00	Core 1	-	011
802.11ac VHT80	0	Back	155	5775.0	12.75	12.30	0.74	0.82	Core 2	-	
Core 2 + Core 0											
802.11ac VHT80	0	Back	155	5775.0	12.75	12.30	0.64	0.71	Core 2	-	-
802.11ac VHT80	0	Back	155	5775.0	12.75	12.50	0.51	0.54	Core 0	-	-
Core 0 + Core 1 + Core 2											
802.11ac VHT80	0	Back	155	5775.0	12.75	12.10	0.44	0.51	Core 0	-	012
802.11ac VHT80	0	Back	155	5775.0	12.75	12.60	0.73	0.76	Core 1	-	
802.11ac VHT80	0	Back	155	5775.0	12.75	12.10	0.58	0.68	Core 2	-	

Note(s):

10.3. Specific Absorption Rate - Test Results - Bluetooth

10.3.1. Bluetooth Body 1g - SISO

Max Reported SAR = 0.21 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	**Dist. (mm)**	**EUT Position**	**CH #**	**Freq (MHz)**	**Tune Up Limit**	**Meas.**	**Meas. SAR Level**	**Reported SAR**	**Transmitting Antenna**	**Notes**	**Plot No.**
Core 1											
GFSK	0	Back	39	2441.0	13.00	13.00	0.19	0.19	Core 1	-	-
GFSK	0	Display	39	2441.0	13.00	13.00	0.02	0.02	Core 1	-	-
GFSK	0	Back	0	2402.0	13.00	12.80	0.20	0.21	Core 1	-	013
GFSK	0	Back	78	2480.0	13.00	13.00	0.19	0.19	Core 1	-	-

Note(s):

10.4. Specific Absorption Rate - Test Results – SDB (Main & Aux)

10.4.1. WLAN 2.4GHz Body 1g - SISO (SDB Main)

Max Reported SAR = 0.12 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	Dist. (mm)	EUT Position	CH #	Freq (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Transmitting Antenna	Notes	Plot No.
Core 2											
802.11b	0	Back	6	2437.0	11.00	10.80	0.11	0.11	Core 2	-	-
802.11b	0	Back	1	2412.0	11.00	10.70	0.11	0.12	Core 2	-	014
802.11b	0	Back	11	2462.0	11.00	10.70	0.09	0.10	Core 2	-	-
Note(s):											

10.4.2. WLAN 5.2GHz Body 1g - SISO (SDB Main)

Max Reported SAR = 0.16 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	Dist. (mm)	EUT Position	CH #	Freq (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Transmitting Antenna	Notes	Plot No.
Core 2											
802.11ac VHT80	0	Back	42	5210.0	6.50	6.10	0.14	0.16	Core 2	-	015
Note(s):											

10.4.3. WLAN 5.6GHz Body 1g - SISO (SDB Main)

Max Reported SAR = 0.15 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	Dist. (mm)	EUT Position	CH #	Freq (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Transmitting Antenna	Notes	Plot No.
Core 2											
802.11ac VHT80	0	Back	122	5610.0	5.75	5.70	0.10	0.11	Core 2	-	-
802.11ac VHT80	0	Back	106	5530.0	5.75	5.50	0.14	0.15	Core 2	-	016
802.11ac VHT80	0	Back	138	5690.0	5.75	5.60	0.09	0.09	Core 2	-	-
Note(s):											

10.4.4. WLAN 5.8GHz Body 1g - SISO (SDB Main)

Max Reported SAR = 0.14 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	Dist. (mm)	EUT Position	CH #	Freq (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Transmitting Antenna	Notes	Plot No.
Core 2											
802.11ac VHT80	0	Back	155	5775.0	5.75	5.60	0.14	0.14	Core 2	-	017
Note(s):											

10.4.5. WLAN 2.4GHz Body 1g - SISO (SDB Aux)

Max Reported SAR = 0.87 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	Dist. (mm)	EUT Position	CH #	Freq (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Transmitting Antenna	Notes	Plot No.
Core 2											
802.11b	0	Back	6	2437.0	18.00	17.90	0.76	0.78	Core 2	-	-
802.11b	0	Back	1	2412.0	18.00	17.60	0.80	0.87	Core 2	-	018
802.11b	0	Back	11	2462.0	18.00	17.50	0.68	0.77	Core 2	-	-

Note(s):

10.4.6. WLAN 5.2GHz Body 1g - SISO (SDB Aux)

Max Reported SAR = 0.91 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	Dist. (mm)	EUT Position	CH #	Freq (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Transmitting Antenna	Notes	Plot No.
Core 2											
802.11ac VHT80	0	Back	42	5210.0	13.50	13.00	0.81	0.91	Core 2	-	019

Note(s):

10.4.7. WLAN 5.6GHz Body 1g - SISO (SDB Aux)

Max Reported SAR = 0.74 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	Dist. (mm)	EUT Position	CH #	Freq (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Transmitting Antenna	Notes	Plot No.
Core 2											
802.11ac VHT80	0	Back	106	5530.0	12.75	12.50	0.69	0.74	Core 2	-	020
802.11ac VHT80	0	Back	122	5610.0	12.75	12.30	0.60	0.66	Core 2	-	-
802.11ac VHT80	0	Back	138	5690.0	12.75	12.30	0.54	0.60	Core 2	-	-

Note(s):

10.4.8. WLAN 5.8GHz Body 1g - SISO (SDB Aux)

Max Reported SAR = 0.80 (W/kg)

					Power (dBm)		1g: SAR Results (W/kg)				
Mode	Dist. (mm)	EUT Position	CH #	Freq (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Transmitting Antenna	Notes	Plot No.
Core 2											
802.11ac VHT80	0	Back	155	5775.0	12.75	12.70	0.79	0.80	Core 2	-	021

Note(s):

10.5. SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz. These 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.

Exposure Configuration	Technology Band	Measured 1g -SAR (W/Kg)	Equipment Class	Max Meas. Source base Avg Power [dBm]	Ratio of Largest to Smallest SAR Measured
BODY (Separation Distance 0mm)	WLAN 2.4 GHz (Main)	1.04	DTS	18.00	1.16
		0.90			
	WLAN 2.4 GHz (SDB Aux)	0.80	DTS	18.00	1.03
		0.78			
	WLAN 5.3 GHz	0.94	U-NII-1	13.10	1.04
		0.90			
	WLAN 5.6 GHz	0.82	U-NII-2C	11.90	1.08
		0.76			
	WLAN 5.8 GHz	0.97	U-NII-3	12.60	1.09
		0.89			

10.6. Highest Standalone Reported SAR

Individual Transmitter Evaluation per Band:

Exposure Configuration	Technology Band	Reported 10g - SAR (W/Kg)												Equipment Class	Highest Reported 1g - SAR (W/Kg)
		SISO			MIMO										
					2x2						3x3				
					Core 0 + Core 1		Core 1 + Core 2		Core 2 + Core 0		Core 0 + Core 1 + Core 2				
		Core 0	Core 1	Core 2	Core 0	Core 1	Core 1	Core 2	Core 2	Core 0	Core 0	Core 1	Core 2		
Normal Operation															
BODY (Separation Distance 0mm)	WLAN 2.4 GHz	0.95	0.74	0.78	0.96	0.86	0.77	0.72	0.86	1.04	0.91	0.80	0.74	DTS	1.04
	WLAN 5.2 GHz	0.96	1.03	0.91	0.95	0.94	0.92	0.80	0.75	0.95	0.96	0.94	0.70	U-NII	1.03
	WLAN 5.3 GHz	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	U-NII	N/A
	WLAN 5.6 GHz	0.74	0.89	0.74	0.80	0.98	0.96	0.76	0.65	0.68	1.00	0.96	0.74	U-NII	1.00
	WLAN 5.8 GHz	0.52	0.88	0.80	0.63	0.99	1.00	0.82	0.71	0.54	0.51	0.76	0.68	U-NII	1.00
	Bluetooth	N/A	0.21	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	DSS	0.21
SDB Mode (Main)															
BODY (Separation Distance 0mm)	WLAN 2.4 GHz	N/A	N/A	0.12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	DTS	0.12
	WLAN 5.2 GHz	N/A	N/A	0.16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	U-NII	0.16
	WLAN 5.3 GHz	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	U-NII	N/A
	WLAN 5.6 GHz	N/A	N/A	0.15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	U-NII	0.15
	WLAN 5.8 GHz	N/A	N/A	0.14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	U-NII	0.14
	Bluetooth	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	DSS	N/A
SDB Mode (Aux)															
BODY (Separation Distance 0mm)	WLAN 2.4 GHz	N/A	N/A	0.87	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	DTS	0.87
	WLAN 5.2 GHz	N/A	N/A	0.91	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	U-NII	0.91
	WLAN 5.3 GHz	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	U-NII	N/A
	WLAN 5.6 GHz	N/A	N/A	0.74	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	U-NII	0.74
	WLAN 5.8 GHz	N/A	N/A	0.80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	U-NII	0.80
	Bluetooth	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	DSS	N/A

11. Simultaneous Transmission Analysis

Simultaneous transmission is determined for each operating configuration and exposure condition according to the *reported* standalone SAR of each applicable simultaneous transmitting antenna.

Case	Simultaneous Transmission Conditions																											
	WLAN (Main)																								WLAN (Aux)		WPAN	Highest Reported Sum-SAR 1g-SAR (W/Kg)
	Wi-Fi 2.4 GHz												Wi-Fi 5.0 GHz												Wi-Fi 2.4 GHz	Wi-Fi 5.0 GHz	BT	
	SISO			MIMO									SISO			MIMO									SISO		SISO	
	Core 0	Core 1	Core 2	Core 0 + Core 1		Core 1 + Core 2		Core 2 + Core 0		Core 0 + Core 1 + Core 2			Core 0	Core 1	Core 2	Core 0 + Core 1		Core 1 + Core 2		Core 2 + Core 0		Core 0 + Core 1 + Core 2			Core 2	Core 2	Core 1	
				Core 0	Core 1	Core 1	Core 2	Core 2	Core 0	Core 0	Core 1	Core 2				Core 0	Core 1	Core 1	Core 2	Core 2	Core 0	Core 0	Core 1	Core 2				
SDB Mode Inactive																												
1													**0.96**														0.21	**0.96**
2														**1.03**													**0.21**	**1.24**
3															**0.91**												0.21	**0.91**
4																0.95	**0.99**										**0.21**	**1.20**
5																		**1.00**	0.82								**0.21**	**1.21**
6																				0.75	**0.95**						0.21	**0.95**
7																						1.00	**0.88**	0.74			**0.21**	**1.09**
8	**0.95**																										0.21	**0.95**
9			**0.78**																								0.21	**0.78**
10								0.86	**1.04**																		0.21	**1.04**
SDB Mode Active																												
11	**0.95**																								0.87			**0.95**
12		0.74																							**0.87**			**0.87**
13		**0.74**																							0.87		**0.21**	**0.95**
14	**0.95**																									**0.91**		**0.95**
15		0.74																								**0.91**		**0.91**
16		**0.74**																								0.91	**0.21**	**0.95**
17			**0.12**																							**0.91**		**1.03**
18			**0.12**																							**0.91**	0.21	**1.03**
19				**0.96**	0.86																					0.91		**0.96**
20						0.77	0.00																			**0.91**		**0.91**
21						**0.77**	0.00																			0.91	**0.21**	**0.98**
22								0.00	**1.04**																	0.91		**1.04**
23										**0.91**	0.80	0.00														0.91		**0.91**

Case	Simultaneous Transmission Conditions																											
	WLAN (Main)																								WLAN (Aux)		WPAN	Highest Reported Sum-SAR 1g-SAR (W/Kg)
	Wi-Fi 2.4 GHz												Wi-Fi 5.0 GHz												Wi-Fi 2.4 GHz	Wi-Fi 5.0 GHz	BT	
	SISO			MIMO									SISO			MIMO									SISO		SISO	
	Core 0	Core 1	Core 2	Core 0 + Core 1		Core 1 + Core 2		Core 2 + Core 0		Core 0 + Core 1 + Core 2			Core 0	Core 1	Core 2	Core 0 + Core 1		Core 1 + Core 2		Core 2 + Core 0		Core 0 + Core 1 + Core 2			Core 2	Core 2	Core 1	
				Core 0	Core 1	Core 1	Core 2	Core 2	Core 0	Core 0	Core 1	Core 2				Core 0	Core 1	Core 1	Core 2	Core 2	Core 0	Core 0	Core 1	Core 2				
SDB Mode Active																												
24													**0.96**												0.87			**0.96**
25													**0.96**												0.87		0.21	**0.96**
26														**1.03**											0.87			**1.03**
27														**1.03**											0.87		**0.21**	**1.24**
28															**0.16**										**0.87**			**1.03**
29															**0.16**										**0.87**		0.21	**1.24**
30																0.95	**0.99**								0.87			**0.99**
31																0.95	**0.99**								0.87		**0.21**	**1.20**
32																		**1.00**	0.00						0.87			**1.00**
33																		**1.00**	0.00						0.87		**0.21**	**1.21**
34																				0.00	**0.95**				0.87			**0.95**
35																				0.00	**0.95**				0.87		0.21	**0.95**
36																						**1.00**	0.96	0.00	0.87			**1.00**
37																						1.00	**0.96**	0.00	0.87		**0.21**	**1.17**
38													**0.96**													0.87		**0.96**
39													**0.96**													0.87	0.21	**0.96**
40														**1.03**												0.87		**1.03**
41														**1.03**												0.87	0.21	**1.24**
42																0.95	**0.99**									0.87		**0.99**
43																0.95	**0.99**									0.87	**0.21**	**1.20**

Notes:

1. "Highest Reported Sum-SAR" column contains the highest reported SAR addition (if applicable) of simultaneous transmission technologies being transmitted on the same antenna. The summation only considered for same antenna {i.e.: Core 1 (5.0 GHz Main - SISO) + Core 1 (BT - SISO)}, as the other transmitting antenna (i.e.: Core 0 or Core 2) is > 50 mm separation distance from Core 1 antenna and does not have any effects on SAR from Core 0 or Core 2 antenna.
2. On cases 20 – 23 and 32 – 37, when Core 2 (Main) is on MIMO mode, measured SAR level has been considered negligible since Core 2 (Main) is set to transmit at 7 dB less than the standard power rate.
3. On cases 17, 18, 20 – 23, 28, 29, 32 – 37 Core 2 Main and Auxiliary cores are transmitting simultaneously.