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

SAR EVALUATION REPORT

For

Portable Computer with IEEE 802.11a/b/g/n/ac (MIMO 2X2) and Bluetooth Radio

Model A1708
FCC ID: BCGA1708

Report Number UL-SAR-RP11150469JD17A V3.0
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Prepared for

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REVISION HISTORY

Version	Issue Date	Revisions	Revised By
1.0	20 September 2016	Initial Issue	--
2.0	23 September 2016	The following amendments were made in the report: 1. Typo corrected in section 6.2 2. Table updated in section 6.3 3. Note Added in section 7.2 4. Table updated in section 8.2.5 and 8.2.6	Naseer Mirza
3.0	06 October 2016	The following amendments were made in the report: 1. Test device description updated in section 1 2. The probe SN3341 calibration date amended in section 4.3 3. SW version has been replaced for FW details and the DUT dimension units 'cm' replace with 'mm' in section 6.1 4. Power measurement table updated in section 6.3 5. Typo amended in section 11.1 6. Calibration certificate for probe SN3341 has been replaced in section 12.4	Naseer Mirza

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1. Attestation of Test Results

Applicant Name	Apple Inc.					
Model	A1708					
Test Device is	a representative test sample					
Device category	Portable					
Date Tested	20 July 2016 to 13 September 2016					
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	0.824 W/kg	1.140 W/kg	0.308 W/kg
	Simultaneous Transmission	Body	N/A	0.771 W/kg	1.448 W/kg	1.448 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.

Approved & Released By:	Prepared By:
	
Naseer Mirza Project Lead UL VS Ltd.	Sandhya Menon Senior 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

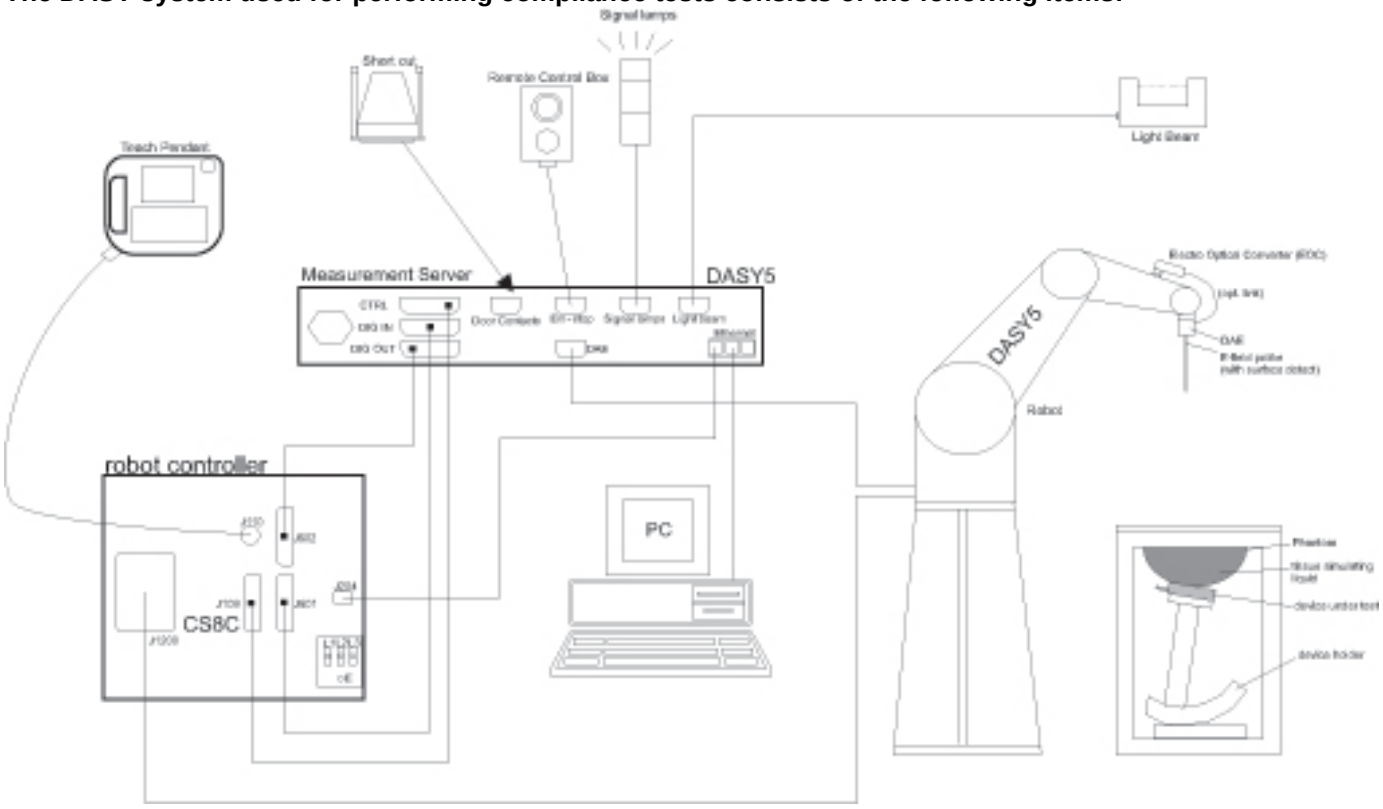
Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG UK	Facility Type
SAR Lab 57	Controlled Environment Chamber
SAR Lab 59	Controlled Environment Chamber
SAR Lab 60	Controlled Environment Chamber
SAR Lab 61	Controlled Environment Chamber

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 WinXP or Win7 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	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
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)
A2546	Data Acquisition Electronics	SPEAG	DAE4	1435	30 May 2016	12
A1234	Data Acquisition Electronics	SPEAG	DAE4	450	28 Sep 2015	12
A2547	Data Acquisition Electronics	SPEAG	DAE4	1438	25 Apr 2016	12
A2587*	Probe	SPEAG	ES3DV3	3341	25 Aug 2015	12
A2545	Probe	SPEAG	EX3DV4	3995	26 Apr 2016	12
A2544	Probe	SPEAG	EX3DV4	3994	21 Mar 2016	12
A2077	Probe	SPEAG	EX3DV4	3814	06 Oct 2015	12
A1322	2450 MHz Dipole Kit	SPEAG	D2450V2	725	10 Nov 2015	12
A1377	5.0 GHz Dipole Kit	SPEAG	D5GHzV2	1016	10 Feb 2016	12
G0591	Robot Power Supply	SPEAG	DASY4	F01/5J86A1/C/01	Calibrated as part of system	-
G0610	Robot Power Supply	SPEAG	DASY52	F13/5SC6F1/C/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	-
M1653	Robot Arm	Staubli	RX90 L	F01/5J86A1/A/01	Calibrated as part of system	-
M1875	Robot Arm	Staubli	TX60 L	F13/5SC6F1/A/01	Calibrated as part of system	-
M1876	Robot Arm	Staubli	TX60 L	F14/5T5ZA1/A/01	Calibrated as part of system	-
M1877	Robot Arm	Staubli	TX60 L	F14/5UA6A1/A/01	Calibrated as part of system	-
A2809	Head Handset Positioner	SPEAG	MD4HHTV5	None	Calibrated before use	-
A2810	Head Handset Positioner	SPEAG	MD4HHTV5	None	Calibrated before use	-
M1755	DAK Fluid Probe	SPEAG	SM DAK 040 CA	1089	Calibrated before use	-
M1855	Power Sensor	R & S	NRP-Z51	103246	05 Oct 2015	12
M1015	Network Analyser	Agilent Technologies	8753ES	US39172406	28 Sep 2015	12
A2621	Digital Camera	Nikon	S3600	41010357	N/A	-
M1838	Signal Generator	R & S	SME06	1038.6002.06	07 Apr 2016	12
M1647*	Signal Generator	R & S	SME06	3537A01598	08 Sep 2015	12
M1840	Dual Channel Power Meter	R & S	NRVD	844860/040	06 Apr 2016	12
M263*	Dual Channel Power Meter	R & S	NRVD	826558/004	02 Sep 2015	12
M1842	Power Sensor	R & S	NRV-Z1	890212/015	01 Apr 2016	12
M1843	Power Sensor	R & S	NRV-Z1	826515/018	01 Apr 2016	12
M265*	Power Sensor	R & S	NRV-Z1	893350/0017	03 Sep 2015	12
M1044*	Power Sensor	R & S	NRV-Z1	893350/0019	03 Sep 2015	12
M1635	Power Sensor	R & S	NRV-Z1	826515/015	13 Apr 2016	12
M1634	Power Sensor	R & S	NRV-Z1	860462/016	13 Apr 2016	12
A2100	Directional Coupler	RF-Lambda	11101300748	None	Calibrated before use	-
A2099	Directional Coupler	RF-Lambda	11101300747	None	Calibrated before use	-
A1938	Amplifier	Mini-Circuits	ZHL-42	QA0826002	Calibrated before use	-
A2689	Amplifier	Mini-Circuits	ZVE-8G	638700305	Calibrated before use	-
A2252	Phantom	SPEAG	Eli Phantom	1177	Calibrated as part of system	-
A2549	Phantom	SPEAG	Eli Phantom	1253	Calibrated as part of system	-
A2550	Phantom	SPEAG	Eli Phantom	1252	Calibrated as part of system	-

UL No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
PRE0141 347	Phantom Support Structure	SPEAG	DASY6 Phantom Table	-	Calibrated as part of system	-
PRE0141 348	Phantom Support Structure	SPEAG	DASY6 Phantom Table	-	Calibrated as part of system	-
PRE0141 350	Phantom Support Structure	SPEAG	DASY6 Phantom Table	-	Calibrated as part of system	-
A2812	Phantom Table	SPEAG	DASY4 Phantom Table	-	Calibrated as part of system	-
M1851	RS Hygrometer	RS Components	#2410WC	D10Q65	18 March 2016	12
M1852	RS Hygrometer	RS Components	#2410WC	D10Q52	18 March 2016	12
M1270	Lab Thermometer	RS Components	None Stated	None Stated	18 March 2016	12
M1650	High Accuracy Digital Thermometer	Dickson	FH320	09099180	18 March 2016	12
PRE0140 104	RF Coax Cable	RM Coax	FB311A102000 3030	-	Calibrated before use	-
PRE0140 063	RF Coax Cable	RM Coax	FB311A102000 3030	-	Calibrated before use	-
PRE0136 924	RF Coax Cable	B4605/100	34	-	Calibrated before use	-

Note: * These equipments were used on or before calibration due date.

4.4. SAR System Specifications

Robot System	
Positioner:	Stäubli Unimation Corp. Robot Model: RX90L
Repeatability:	0.025 mm
No. of Axis:	6
Serial Number(s):	F01/5J86A1/C/01
Reach:	1185 mm
Payload:	3.5 kg
Control Unit:	CS7
Programming Language:	V+
Robot System	
Positioner:	Stäubli Unimation Corp. Robot Model: TX60L
Repeatability:	±0.030 mm
No. of Axis:	6
Serial Number(s):	F13/5SC6F1/C/01; F14/5UA6A1/C/01; F14/5T5ZA1/C/01
Reach:	920 mm
Payload:	2.0 kg
Control Unit:	CS8C
Programming Language:	V+
Data Acquisition Electronic (DAE) System	
Serial Number:	DAE4 SN:1435, 450, 1438
PC Controller	
PC:	Dell Precision 340
Operating System:	Windows 2000
Data Card:	DASY4 and DASY5 Measurement Servers
Serial Number:	1080
Data Converter	
Features:	Signal Amplifier, multiplexer, A/D converted and control logic.
Software:	DASY4 and DASY5 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 DAE3 and 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

SAR System Specifications (Continued):

E-Field Probe		
Model:	ES3DV3	EX3DV4
Serial No:	3341	3995, 3994, 3814
Construction:	Triangular core	Triangular core
Frequency:	10 MHz to >4 GHz	10 MHz to >6 GHz
Linearity:	±0.2 dB (30 MHz to 4 GHz)	±0.2 dB (30 MHz to 6 GHz)
Probe Length (mm):	337	337
Probe Diameter (mm):	10	10
Tip Length (mm):	10	9
Tip Diameter (mm):	4	2.5
Sensor X Offset (mm):	2	1
Sensor Y Offset (mm):	2	1
Sensor Z Offset (mm):	2	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 Body Configuration 1g	95 %	±19.88 %
Uncertainty- Freq. > 3 GHz Body Configuration 1g	95 %	±16.61 %

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 1 g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (1g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	5.050	5.050	normal (k=1)	1.0000	1.0000	5.050	5.050	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.300	0.300	Rectangular	1.7321	1.0000	0.173	0.173	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	8.520	8.520	Rectangular	1.7321	1.0000	4.919	4.919	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.580	2.580	normal (k=1)	1.0000	1.0000	2.580	2.580	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	2.470	2.470	normal (k=1)	1.0000	0.6400	1.581	1.581	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	2.430	2.430	normal (k=1)	1.0000	0.6000	1.458	1.458	5
	Combined standard uncertainty			t-distribution			10.14	10.14	>500
	Expanded uncertainty			k = 1.96			19.88	19.88	>500

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

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (1g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	5.050	5.050	normal (k=1)	1.0000	1.0000	5.050	5.050	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.300	0.300	Rectangular	1.7321	1.0000	0.173	0.173	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	1.960	1.960	normal (k=1)	1.0000	1.0000	1.960	1.960	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	0.770	0.770	normal (k=1)	1.0000	0.6400	0.493	0.493	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	0.990	0.990	normal (k=1)	1.0000	0.6000	0.594	0.594	5
	Combined standard uncertainty			t-distribution			8.47	8.47	>500
	Expanded uncertainty			k = 1.96			16.61	16.61	>500

6. Device Under Test (DUT) Information

6.1. DUT Description

DUT Description:	The EUT supports WLAN 2.4 GHz (802.11 b/g/n) with MIMO 2X2, WLAN 5.0 GHz {802.11a/n (HT20, HT40), 802.11ac (VHT20, VHT40, VHT80)} with MIMO 2x2, *Bluetooth* (BDR, EDR and BLE). The device supports CDD and SDM, TxBF and non-TxBF modes for WLAN 2.4GHz and 5.0GHz MIMO.
Serial Number:	**The following samples were used to perform radiated SAR measurements:** C02RV00MH9FM: WLAN 5.2GHz SISO WF2 and MIMO WF1& WF2 WLAN 5.5GHz SISO WF1, WF2 and MIMO WF1& WF2 C02RV00RH9FM: WLAN 2.4GHz SISO WF1, WF2 and MIMO WF1& WF2 WLAN 5.2GHz SISO WF1 WLAN 5.8GHz SISO WF1, WF2 and MIMO WF1& WF2 **The following sample was used to perform conducted SAR measurements:** C02RV00YH9FM: WLAN 2.4GHz / 5.0GHz SISO and MIMO
Hardware Version Number:	DVT
Firmware (WLAN):	7.21.163
Firmware (WPAN):	V91 c5459
Country of Manufacture:	China
Device dimension	Overall (Height x Width x Depth): 15.60 mm x 304.10 mm x 212.4 mm
Weight:	1.36 Kg
Date of Receipt:	01 July 2016

Antenna Type:	Internal integral	
Antenna Length:	Unknown	
Number of Antenna Positions:	Antenna 1 (WF1) - WLAN ~ Wi-Fi 2.4 GHz / 5.0 GHz	1 fixed
	Antenna 2 (WF2) - WLAN / WPAN ~ Wi-Fi 2.4 GHz / 5.0 GHz / BT	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)

Wi-Fi						
Band	Description					
	20 MHz BW Ch.#	Frq. (MHz)	40 MHz BW Ch.#	Frq. (MHz)	80 MHz BW Ch.#	Frq. (MHz)
Wi-Fi 2.4 GHz (802.11b/g/n)	1	2412.0	N/A			
	6	2437.0				
	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	-			

Wireless Technologies (Continued)

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
	BLE Mode	1	Low	2404.0
		20	Middle	2446.0
		38	High	2478.0

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

			Target + Max. Tolerances (dBm) - applicable to all antenna's (WF1 and WF2)					
Band	**Channel**	**Center 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)**
WLAN 2.4GHz	1	2412	16.75	14.00	14.00	16.50	14.00	9.50
	2	2417	16.75	15.50	15.50	16.75	15.50	10.00
	3	2422	16.75	16.75	16.75	16.75	16.50	14.50
	4	2427	16.75	16.75	16.75	16.75	16.75	16.50
	5	2432	16.75	16.75	16.75	16.75	16.75	16.75
	6	2437	16.75	16.75	16.75	16.75	16.75	16.75
	7	2442	16.75	16.75	16.75	16.75	16.75	16.75
	8	2447	16.75	16.75	16.75	16.75	16.75	16.50
	9	2452	16.75	16.75	16.75	16.75	15.50	15.00
	10	2457	16.75	16.75	16.75	16.75	14.50	13.50
	11	2462	16.75	13.50	13.50	15.50	10.50	9.00
	12	2467	15.50	10.50	10.50	13.50	8.50	6.00
	13	2472	10.00	0.00	0.00	10.50	-3.00	-5.00

		Target + Max. Tolerances (dBm) - applicable to WF2 antenna		
Band	**Channel**	**BDR (SISO)**	**EDR (SISO)**	**BLE (SISO)**
Bluetooth	ALL	12.00	10.00	4.75

Note: Bluetooth operates only on Antenna WF2

Nominal and Maximum Output Power (Continued)

			Target + Max. Tolerances (dBm) - applicable to all antenna's (WF1 and WF2)				
Band	**Channel (20 MHz BW)**	**Center Frequency (MHz)**	**802.11a (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)**
Sub Band 1 - 5.2 GHz	36	5180	13.75	13.75	13.75	13.75	12.00
	40	5200	13.75	13.75	12.00	13.75	12.00
	44	5220	13.75	13.75	12.00	13.75	12.00
	48	5240	13.75	13.75	12.00	13.75	12.00
Sub Band 2 - 5.3 GHz	52	5260	12.50	12.50	11.50	12.50	11.50
	56	5280	12.50	12.50	11.50	12.50	11.50
	60	5300	12.50	12.50	11.50	12.50	11.50
	64	5320	12.50	12.50	12.50	12.50	11.50
Sub Band 3 - 5.5 GHz	100	5500	12.50	12.50	12.50	12.50	12.00
	104	5520	12.50	12.50	12.00	12.50	12.00
	108	5540	12.50	12.50	12.00	12.50	12.00
	112	5560	12.50	12.50	12.00	12.50	12.00
	116	5580	12.50	12.50	11.50	12.50	11.50
	120	5600	12.50	12.50	11.50	12.50	11.50
	124	5620	12.50	12.50	11.50	12.50	11.50
	128	5640	12.50	12.50	11.50	12.50	11.50
	132	5660	12.50	12.50	11.50	12.50	11.50
	136	5680	12.50	12.50	11.50	12.50	11.50
	140	5700	12.50	12.50	12.50	12.50	11.50
	144	5720	12.50	12.50	11.50	12.50	11.50
Sub Band 4 - 5.8 GHz	149	5745	13.25	13.25	13.25	13.25	13.25
	153	5765	13.25	13.25	13.25	13.25	13.25
	157	5785	13.25	13.25	13.25	13.25	13.25
	161	5805	13.25	13.25	13.25	13.25	13.25
	165	5825	13.25	13.25	13.25	13.25	13.25

			Target + Max. Tolerances (dBm) - applicable to all antenna's (WF1 and WF2)			
Band	**Channel (40 MHz BW)**	**Center 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)**
Sub Band 1 - 5.2 GHz	38	5190	13.75	12.00	12.00	8.00
	46	5230	13.75	13.75	13.75	13.75
Sub Band 2 - 5.3 GHz	54	5270	12.50	12.50	12.50	12.50
	62	5310	12.50	12.50	12.50	12.50
Sub Band 3 - 5.5 GHz	102	5510	12.50	12.50	12.50	12.50
	110	5550	12.50	12.50	12.50	12.50
	118	5590	12.50	12.50	12.50	12.50
	126	5630	12.50	12.50	12.50	12.50
	134	5670	12.50	12.50	12.50	12.50
	142	5710	12.50	12.50	12.50	12.50
Sub Band 4 - 5.8 GHz	151	5755	13.25	13.25	13.25	13.25
	159	5795	13.25	13.25	13.25	13.25

			Target + Max. Tolerances (dBm) - applicable to all antenna's (WF1 and WF2)			
Band	**Channel (80 MHz BW)**	**Center 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)**
Sub Band 1 - 5.2 GHz	42	5210	12.50	8.00	9.00	6.50
Sub Band 2 - 5.3 GHz	58	5290	12.50	9.00	10.00	8.00
Sub Band 3 - 5.5 GHz	106	5530	12.50	11.00	12.00	11.00
	122	5610	12.50	12.50	12.50	12.50
	138	5690	12.50	12.50	12.50	12.50
Sub Band 4 - 5.8 GHz	155	5775	13.25	13.25	13.25	12.50

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
WF1 WLAN ~ Wi-Fi 5.0 GHz Antenna (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
WF2 WLAN / WPAN ~ Wi-Fi 5.0 GHz Antenna (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

Note:
The Antenna to edge separation distances are indicated in the 'Antenna Schematics' located in Section 12.1 of this report.

7.2. SAR Test Exclusion Consideration

Frequency Band	Configuration(s)	
	Body	
	SISO	MIMO
WLAN 2.4 GHz	No	No
WLAN 5.2 GHz	No	No
WLAN 5.3 GHz	Yes[1]	Yes[1]
WLAN 5.5 GHz	No	No
WLAN 5.8 GHz	No	No
Bluetooth	No	N/A

Note:

1. 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 2.4GHz

8.1.1. Wi-Fi 802.11b/g/n (2.4 GHz) - SISO

		Avg Power (dBm)		
		WF1	WF2	
Channel Number	Frequency (MHZ)	6Mbps	6Mbps	Operating Mode
		Body	Body	
1	2412	16.50	16.50	802.11b
6	2437	16.70	16.70	
11	2462	16.50	16.50	
12	2467	15.20	15.50	
1	2412	13.80	13.90	802.11g
6	2437	16.60	16.50	
10	2457	16.70	16.40	
11	2462	13.00	13.20	

Note: 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).

8.1.2. Wi-Fi 802.11b/g/n (2.4 GHz) – MIMO
WF1 + WF2

		Avg Power (dBm)		
		WF1	WF2	
Channel Number	Frequency (MHZ)	6.5Mbps	6.5Mbps	Operating Mode
		Body	Body	
1	2412	15.90	16.30	802.11n, HT20 DSSS
2	2417	16.30	16.40	
6	2437	16.60	16.60	
10	2457	16.50	16.70	
11	2462	15.30	15.50	
12	2467	13.50	13.50	

Note: 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).

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

8.2.1. Wi-Fi 802.11a/n/ac (5.0 GHz) – SISO Sub Band 1 (5.2 GHz U-NII-1)

		Avg Power (dBm)		
		WF1	WF2	
Channel Number	Frequency (MHz)	6 Mbps	6 Mbps	Operating Mode
		Body	Body	
36	5180	13.30	13.40	802.11a
40	5200	13.40	13.50	
44	5220	13.40	13.60	
48	5240	13.40	13.50	
Channel Number	Frequency (MHz)	13.5 Mbps	13.5 Mbps	Operating Mode
		Body	Body	
38	5190	13.60	13.40	802.11n HT40
46	5230	13.50	13.70	
Channel Number	Frequency (MHz)	29.3 Mbps	29.3 Mbps	Operating Mode
		Body	Body	
42	5210	12.20	12.10	802.11ac VHT80

8.2.2. Wi-Fi 802.11a/n/ac (5.0 GHz) – MIMO Sub Band 1 (5.2 GHz U-NII-1) WF1 + WF2

		Avg Power (dBm)		
		WF1	WF2	
Channel Number	Frequency (MHz)	6 Mbps	6 Mbps	Operating Mode
		Body	Body	
36	5180	13.60	13.40	802.11n HT20
40	5200	13.75	13.40	
44	5220	13.75	13.40	
48	5240	13.75	13.40	
Channel Number	Frequency (MHz)	13.5 Mbps	13.5 Mbps	Operating Mode
		Body	Body	
38	5190	11.90	11.50	802.11n HT40 SDM, non-TxBF
46	5230	13.75	13.20	
Channel Number	Frequency (MHz)	29.3 Mbps	29.3 Mbps	Operating Mode
		Body	Body	
42	5210	9.00	9.00	802.11ac VHT80 SDM, non-TxBF

8.2.3. Wi-Fi 802.11a/n/ac (5.0 GHz) – SISO Sub Band 2 (5.3 GHz U-NII-2A)

		Avg Power (dBm)		
		WF1	WF2	
Channel Number	Frequency (MHz)	6 Mbps	6 Mbps	Operating Mode
		Body	Body	
52	5260	12.40	12.40	802.11a
56	5280	12.40	12.40	
60	5300	12.50	12.50	
64	5320	12.50	12.50	
Channel Number	Frequency (MHz)	13.5 Mbps	13.5 Mbps	Operating Mode
		Body	Body	
54	5270	12.10	12.10	802.11n HT40
62	5310	12.30	12.30	
Channel Number	Frequency (MHz)	29.3 Mbps	29.3 Mbps	Operating Mode
		Body	Body	
58	5290	12.30	12.20	802.11ac VHT80

8.2.4. Wi-Fi 802.11a/n/ac (5.0 GHz) – MIMO Sub Band 2 (5.3 GHz U-NII-2A) WF1 + WF2

		Avg Power (dBm)		
		WF1	WF2	
Channel Number	Frequency (MHz)	6 Mbps	6 Mbps	Operating Mode
		Body	Body	
52	5260	12.50	12.20	802.11n HT20
56	5280	12.50	12.10	
60	5300	12.20	11.70	
64	5320	12.30	12.00	
Channel Number	Frequency (MHz)	13.5 Mbps	13.5 Mbps	Operating Mode
		Body	Body	
54	5270	12.50	12.20	802.11n HT40 SDM, non-TxBF
62	5310	12.50	12.30	
Channel Number	Frequency (MHz)	29.3 Mbps	29.3 Mbps	Operating Mode
		Body	Body	
58	5290	10.00	9.70	802.11ac VHT80 SDM, non-TxBF

8.2.5. Wi-Fi 802.11a/n/ac (5.0 GHz) – SISO Sub Band 3 (5.5 GHz U-NII-2C)

		Avg Power (dBm)		
		WF1	WF2	
Channel Number	Frequency (MHz)	6 Mbps	6 Mbps	Operating Mode
		Body	Body	
100	5500	12.50	12.40	802.11a
104	5520	12.50	12.30	
108	5540	12.40	12.50	
112	5560	12.50	12.50	
116	5580	12.50	12.50	
120	5600	11.90	12.00	
124	5620	12.00	11.90	
128	5640	11.80	12.00	
132	5640	12.50	12.40	
136	5680	12.40	12.30	
140	5700	12.40	12.40	
144	5720	12.50	12.40	
Channel Number	Frequency (MHz)	13.5 Mbps	13.5 Mbps	Operating Mode
		Body	Body	
102	5510	12.10	12.40	802.11n HT40
110	5550	12.00	12.40	
118	5590	11.70	11.80	
126	5630	11.70	11.90	
134	5670	11.90	12.20	
142	5710	11.80	12.10	
Channel Number	Frequency (MHz)	29.3 Mbps	29.3 Mbps	Operating Mode
		Body	Body	
106	5530	12.20	12.35	802.11ac VHT80
122	5610	11.50	11.40	
138	5690	12.10	12.20	

8.2.6. Wi-Fi 802.11a/n/ac (5.0 GHz) – MIMO Sub Band 3 (5.5 GHz U-NII-2C) WF1 + WF2

		Avg Power (dBm)		
		WF1	WF2	
Channel Number	Frequency (MHz)	6 Mbps	6 Mbps	Operating Mode
		Body	Body	
100	5500	12.50	12.00	802.11n HT20
104	5520	12.50	12.00	
108	5540	12.50	12.00	
112	5560	12.50	11.90	
116	5580	12.50	11.70	
120	5600	11.60	11.60	
124	5620	11.80	11.80	
128	5640	11.80	11.60	
132	5640	12.40	11.70	
136	5680	12.40	11.50	
140	5700	12.50	11.50	
144	5720	12.50	12.00	
Channel Number	Frequency (MHz)	13.5 Mbps	13.5 Mbps	Operating Mode
		Body	Body	
102	5510	12.30	11.70	802.11n HT40 SDM, non-TxBF
110	5550	12.50	12.10	
118	5590	11.80	11.90	
126	5630	11.80	11.80	
134	5670	12.30	11.70	
142	5710	12.30	11.70	
Channel Number	Frequency (MHz)	29.3 Mbps	29.3 Mbps	Operating Mode
		Body	Body	
106	5530	11.90	11.10	802.11ac VHT80 SDM, non-TxBF
122	5610	11.10	10.90	
138	5690	11.30	11.20	

8.2.7. Wi-Fi 802.11a/n/ac (5.0 GHz) – SISO Sub Band 4 (5.8 GHz U-NII-3)

		Avg Power (dBm)		
		WF1	WF2	
Channel Number	Frequency (MHz)	6 Mbps	6 Mbps	Operating Mode
		Body	Body	
149	5745	13.20	13.00	802.11a
153	5765	13.20	13.00	
157	5785	13.30	13.00	
161	5805	13.10	13.00	
165	5825	13.20	13.00	
Channel Number	Frequency (MHz)	13.5 Mbps	13.5 Mbps	Operating Mode
		Body	Body	
151	5755	12.80	12.80	802.11n HT40
159	5795	12.80	12.90	
Channel Number	Frequency (MHz)	29.3 Mbps	29.3 Mbps	Operating Mode
		Body	Body	
155	5775	13.00	13.00	802.11ac VHT80

8.2.8. Wi-Fi 802.11a/n/ac (5.0 GHz) – MIMO Sub Band 4 (5.8 GHz U-NII-3) WF1 + WF2

		Avg Power (dBm)		
		WF1	WF2	
Channel Number	Frequency (MHz)	6 Mbps	6 Mbps	Operating Mode
		Body	Body	
149	5745	13.20	12.40	802.11n HT20
153	5765	13.20	12.25	
157	5785	13.25	12.80	
161	5805	13.10	12.25	
165	5825	13.10	12.40	
Channel Number	Frequency (MHz)	13.5 Mbps	13.5 Mbps	Operating Mode
		Body	Body	
151	5755	13.25	12.10	802.11n HT40 SDM, non-TxBF
159	5795	13.25	12.50	
Channel Number	Frequency (MHz)	29.3 Mbps	29.3 Mbps	Operating Mode
		Body	Body	
155	5775	13.25	12.60	802.11ac VHT80 SDM, non-TxBF

8.3. RF Output Average Power Measurement: Bluetooth

8.3.1. Bluetooth 2.4 GHz

Channel Number	Frequency (MHz)	WF2	Operating Mode
0	2402	10.65	**BDR (GFSK DH5)**
39	2441	10.55	
78	2480	10.80	
0	2402	8.30	**EDR (GFSK 2DH5)**
39	2441	8.70	
78	2480	8.70	

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	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
750	41.9	0.89	-	-
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1500	40.4	1.23	-	-
1610	40.3	1.29	53.8	1.40
1640	40.2	1.31	-	-
1750	40.1	1.37	-	-
1800	40	1.40	53.3	1.52
1900	40	1.40	53.3	1.52
2000	40	1.40	53.3	1.52
2100	39.8	1.49	-	-
2300	39.5	1.67	-	-
2450	39.2	1.80	52.7	1.95
2600	39	1.96	-	-
3000	38.5	2.40	52.0	2.73
3500	37.9	2.91	-	-
4000	37.4	3.43	-	-
4500	36.8	3.94	-	-
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5250	35.9	4.71	48.9	5.36
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5750	35.4	5.22	48.3	5.94
5800	35.3	5.27	48.2	6.00
6000	35.1	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)	Target SAR Values (mW/g)	
				1g/10g	Body
D2450V2	725	10 Nov 2015	2450	1g	51.90
				10g	24.50
D5GHzV2	1016	10 Feb 2016	5250	1g	73.9
				10g	20.8
			5600	1g	78.7
				10g	22.1
			5750	1g	73.9
				10g	20.7

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 ±5%.

Site 57

System check 2450 Body
Date: 18/07/2016
Validation dipole and Serial Number: D2450V2 / SN: 725

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2450	25.0 ℃	25.0 ℃	**εr**	52.70	50.98	-3.26	5.00
				σ	1.95	2.03	3.85	5.00
				1g	51.90	52.80	1.73	5.00
				10g	24.50	24.84	1.39	5.00

System check 2450 Body
Date: 01/08/2016
Validation dipole and Serial Number: D2450V2 / SN: 725

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2450	23.0 ℃	23.0 ℃	**εr**	52.70	51.61	-2.07	5.00
				σ	1.95	2.00	2.72	5.00
				1g	51.90	52.00	0.19	5.00
				10g	24.50	23.84	-2.69	5.00

Site 59

System check 2450 Body
Date: 07/09/2016
Validation dipole and Serial Number: D2450V2 / SN: 725

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2450	23.0 ℃	23.0 ℃	**εr**	52.70	50.27	-4.61	5.00
				σ	1.95	2.03	3.85	5.00
				1g	51.90	52.80	1.73	5.00
				10g	24.50	24.32	-0.73	5.00

System check 2450 Body
Date: 12/09/2016
Validation dipole and Serial Number: D2450V2 / SN: 725

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2450	23.0 ℃	23.0 ℃	**εr**	52.70	50.21	-4.72	5.00
				σ	1.95	2.04	4.62	5.00
				1g	51.90	51.60	-0.58	5.00
				10g	24.50	23.84	-2.69	5.00

Site 60

System check 5250 Body
Date: 25/07/2016
Validation dipole and Serial Number: D5GHzV2 / SN: 1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5250	23.0 ℃	24.5 ℃	**εr**	48.90	48.82	-0.16	5.00
				σ	5.36	5.24	-2.33	5.00
				1g	73.90	71.40	-3.38	5.00
				10g	20.80	21.50	3.37	5.00

System check 5600 Body
Date: 25/07/2016
Validation dipole and Serial Number: D5GHzV2 / SN: 1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5600	23.0 ℃	24.5 ℃	**εr**	48.50	48.10	-0.82	5.00
				σ	5.77	5.78	0.12	5.00
				1g	78.70	75.10	-4.57	5.00
				10g	22.10	22.20	0.45	5.00

Site 61

System check 5250 Body
Date: 05/09/2016
Validation dipole and Serial Number: D5GHzV2 / SN: 1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5250	24.0 ℃	25.0 ℃	**εr**	48.90	50.08	2.41	5.00
				σ	5.36	5.26	-1.85	5.00
				1g	73.90	72.70	-1.62	5.00
				10g	20.80	20.50	-1.44	5.00

System check 5600 Body
Date: 22/08/2016
Validation dipole and Serial Number: D5GHzV2 / SN: 1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5600	24.0 ℃	23.0 ℃	**εr**	48.50	46.72	-3.67	5.00
				σ	5.77	5.85	1.42	5.00
				1g	78.70	79.30	0.76	5.00
				10g	22.10	21.10	-4.52	5.00

System check 5600 Body
Date: 05/09/2016
Validation dipole and Serial Number: D5GHzV2 / SN: 1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5600	24.0 ℃	25.0 ℃	**εr**	48.50	49.50	2.06	5.00
				σ	5.77	5.83	0.99	5.00
				1g	78.70	79.20	0.64	5.00
				10g	22.10	22.20	0.45	5.00

Site 61 (Continued)

System check 5750 Body
Date: 25/07/2016
Validation dipole and Serial Number: D5GHzV2 / SN: 1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5750	24.0 ℃	25.0 ℃	**εr**	48.30	48.50	0.41	5.00
				σ	5.94	6.07	2.22	5.00
				1g	73.90	72.10	-2.44	5.00
				10g	20.70	19.80	-4.35	5.00

System check 5750 Body
Date: 05/09/2016
Validation dipole and Serial Number: D5GHzV2 / SN: 1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5750	24.0 ℃	25.0 ℃	**εr**	48.30	49.15	1.76	5.00
				σ	5.94	6.08	2.34	5.00
				1g	73.90	74.00	0.14	5.00
				10g	20.70	20.90	0.97	5.00

10. Measurements, Examinations and Derived Results

10.1. General Comments

SAR test was performed in accordance with the criteria in KDB 248227.

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 modes was determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. Since multiple channel bandwidth configurations have the same specified maximum output power, SAR test was performed on the largest channel bandwidth with the lowest order modulation. Additional runs were also performed on lowest order 802.11 mode in order to establish that all worst cases have been evaluated. The test approach method was confirmed via a KDB inquiry.

10.2. Specific Absorption Rate - Test Results - WiFi
For All SAR measurement in this report the 1g-SAR limit tested to is 1.6 W/Kg

10.2.1. Wi-Fi 2.4 GHz – Body Configuration 1g SISO (WF1)
Max Reported SAR = 0.463 W/kg)

					Power (dBm) – WF1		1g: SAR Results (W/kg) - WF1		Power (dBm) – WF2		1g: SAR Results (W/kg) - WF2		
Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Mod.	Meas.	Reported	Scan No.
DBPSK (802.11b 6Mbps)	0.0	Back	6	2437.0	16.75	16.70	0.458	0.463					1
	0.0	Display Side	6	2437.0	16.75	16.70	0.024	0.024					2

10.2.2. Wi-Fi 2.4 GHz – Body Configuration 1g SISO (WF2)
Max Reported SAR = 0.709 (W/kg)

					Power (dBm) – WF1		1g: SAR Results (W/kg) - WF1		Power (dBm) – WF2		1g: SAR Results (W/kg) - WF2		
Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Mod.	Meas.	Reported	Scan No.
DBPSK (802.11b 6Mbps)	0.0	Back	6	2437.0					16.75	16.70	0.701	0.709	3
	0.0	Display Side	6	2437.0					16.75	16.70	0.020	0.020	4

10.2.3. Wi-Fi 2.4 GHz – Body Configuration 1g MIMO (WF1 + WF2)
Max Reported SAR = 0.824 (W/kg)

					Power (dBm) – WF1		1g: SAR Results (W/kg) - WF1		Power (dBm) – WF2		1g: SAR Results (W/kg) - WF2		
Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	Scan No.
DBPSK (802.11n HT20)	0.0	Back	10	2457.0	16.75	16.50	0.778	0.824	16.75	16.70	0.570	0.577	5
	0.0	Back	2	2417.0	16.75	16.30	0.647	0.718	16.75	16.40	0.514	0.557	6
	0.0	Back	6	2437.0	16.75	16.60	0.766	0.793	16.75	16.60	0.523	0.541	7

Note: Worst case configuration obtained from Wi-Fi 2.4GHz SISO mode was used to evaluate MIMO mode.

10.2.4. Wi-Fi 5.0 GHz (Sub Band 1 U-NII-1) – Body Configuration 1g SISO (WF1)
Max. Reported SAR: 1.049 (W/kg)

					Power (dBm) – WF1		1g: SAR Results (W/kg) - WF1		Power (dBm) – WF2		1g: SAR Results (W/kg) - WF2		
Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	Scan No.
BPSK (802.11n HT40)	0.0	Back	38	5190.0	13.75	13.60	0.828	0.857					8
	0.0	Back	46	5230.0	13.75	13.50	0.990	1.049					9
	0.0	Display Side	38	5190.0	13.75	13.60	0.155	0.160					10

10.2.5. Wi-Fi 5.0 GHz (Sub Band 1 U-NII-1) – Body Configuration 1g SISO (WF2)
Max. Reported SAR: 0.992 (W/kg)

					Power (dBm) – WF1		1g: SAR Results (W/kg) - WF1		Power (dBm) – WF2		1g: SAR Results (W/kg) - WF2		
Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	Scan No.
BPSK (802.11n HT40)	0.0	Back	46	5230.0					13.75	13.70	0.877	0.887	11
	0.0	Back	38	5190.0					13.75	13.40	0.915	0.992	12
	0.0	Display Side	46	5230.0					13.75	13.70	0.212	0.214	13

10.2.6. Wi-Fi 5.0 GHz (Sub Band 1 U-NII-1) – Body Configuration 1g MIMO (WF1 + WF2)
Max. Reported SAR: 1.140 (W/kg)

					Power (dBm) – WF1		1g: SAR Results (W/kg) - WF1		Power (dBm) – WF2		1g: SAR Results (W/kg) - WF2		
Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	Scan No.
BPSK (802.11n HT40 SDM)	0.0	Back	46	5230.0	13.75	13.75	1.140	1.140	13.75	13.20	0.832	0.944	14
	0.0	Back	38	5190.0	12.00	11.90	0.657	0.672	12.00	11.50	0.548	0.615	15
BPSK (802.11n HT20 SDM)	0.0	Back	40	5200.0	13.75	13.75	-	-	13.75	13.40	0.945	1.024	16
	0.0	Back	44	5220.0	13.75	13.75	0.946	0.946	13.75	13.40	0.814	0.882	17

Note:

1. Worst case configuration obtained from Wi-Fi 5.0GHz (Sub-band 1) SISO mode was used to evaluate MIMO mode.
2. For some of the 2Tx measurements, there is no additional zoom scans due to secondary peak not being with 2dB of maximum peak.

10.2.7. Wi-Fi 5.0 GHz (Sub Band 2 U-NII-2A) – Body Configuration 1g

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.

10.2.8. Wi-Fi 5.0 GHz (Sub Band 3 U-NII-2C) – Body Configuration 1g SISO (WF1)
Max. Reported SAR: 0.762 (W/kg)

					Power (dBm) – WF1		1g: SAR Results (W/kg) - WF1		Power (dBm) – WF2		1g: SAR Results (W/kg) - WF2		
Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	Scan No.
BPSK (802.11ac VHT80)	0.0	Back	106	5530.0	12.50	12.20	0.711	0.762					18

Note: Worst case configuration obtained from Wi-Fi 5.0GHz (Sub-band 1) SISO mode was used to evaluate Wi-Fi 5.0GHz (Sub-band 3) SISO mode.

10.2.9. Wi-Fi 5.0 GHz (Sub Band 3 U-NII-2C) – Body Configuration 1g SISO (WF2)
Max. Reported SAR: 0.750 (W/kg)

					Power (dBm) – WF1		1g: SAR Results (W/kg) - WF1		Power (dBm) – WF2		1g: SAR Results (W/kg) - WF2		
Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	Scan No.
BPSK (802.11ac VHT80)	0.0	Back	106	5530.0					12.50	12.35	0.725	0.750	19

Note: Worst case configuration obtained from Wi-Fi 5.0GHz (Sub-band 1) SISO mode was used to evaluate Wi-Fi 5.0GHz (Sub-band 3) SISO mode.

10.2.10. Wi-Fi 5.0 GHz (Sub Band 3 U-NII-2C) – Body Configuration 1g MIMO (WF1 + WF2)
Max. Reported SAR: 1.067 (W/kg)

					Power (dBm) – WF1		1g: SAR Results (W/kg) - WF1		Power (dBm) – WF2		1g: SAR Results (W/kg) - WF2		
Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	Scan No.
BPSK (802.11ac VHT80)	0.0	Back	138	5690.0	12.50	11.30	0.708	0.933	12.50	11.20	0.758	1.023	20
	0.0	Back	106	5530.0	12.00	11.90	0.836	0.855	12.00	11.10	0.759	0.934	21
BPSK (802.11n HT40)	0.0	Back	110	5550.0	12.50	12.50	1.040	1.040	12.50	12.10	0.973	1.067	22
	0.0	Back	134	5670.0	12.50	12.30	0.863	0.904	12.50	11.70	0.857	1.030	23

Note: Worst case configuration obtained from Wi-Fi 5.0GHz (Sub-band 1) SISO mode was used to evaluate Wi-Fi 5.0GHz (Sub-band 3) MIMO mode.

10.2.11. Wi-Fi 5.0 GHz (Sub Band 4 U-NII-3) – Body Configuration 1g SISO (WF1)
Max. Reported SAR: 0.873 (W/kg)

					Power (dBm) – WF1		1g: SAR Results (W/kg) - WF1		Power (dBm) – WF2		1g: SAR Results (W/kg) - WF2		
Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	Scan No.
BPSK (802.11ac VHT80)	0.0	Back	155	5775.0	13.25	13.00	0.824	0.873					24

Note: Worst case configuration obtained from Wi-Fi 5.0GHz (Sub-band 1) SISO mode was used to evaluate Wi-Fi 5.0GHz (Sub-band 4) SISO mode.

10.2.12. Wi-Fi 5.0 GHz (Sub Band 4 U-NII-3) – Body Configuration 1g SISO (WF2)
Max. Reported SAR: 0.822 (W/kg)

					Power (dBm) – WF1		1g: SAR Results (W/kg) - WF1		Power (dBm) – WF2		1g: SAR Results (W/kg) - WF2		
Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	Scan No.
BPSK (802.11ac VHT80)	0.0	Back	155	5775.0					13.25	13.00	0.776	0.822	25

Note: Worst case configuration obtained from Wi-Fi 5.0GHz (Sub-band 1) SISO mode was used to evaluate Wi-Fi 5.0GHz (Sub-band 4) SISO mode.

10.2.13. Wi-Fi 5.0 GHz (Sub Band 4 U-NII-3) – Body Configuration 1g MIMO (WF1 + WF2)
Max. Reported SAR: 0.950 (W/kg)

					Power (dBm) – WF1		1g: SAR Results (W/kg) - WF1		Power (dBm) – WF2		1g: SAR Results (W/kg) - WF2		
Mod.	Dist (mm)	EUT Position	CH #	Freq (MHz)	Tune up Limit	Meas. Power	Meas.	Reported	Tune up Limit	Meas. Power	Meas.	Reported	Scan No.
BPSK (802.11ac VHT80)	0.0	Back	155	5775.0	13.25	13.25	0.900	0.900	13.25	12.60	0.818	0.950	26

Note: Worst case configuration obtained from Wi-Fi 5.0GHz (Sub-band 1) SISO mode was used to evaluate Wi-Fi 5.0GHz (Sub-band 4) MIMO mode.

10.3. Specific Absorption Rate - Test Results - Bluetooth

10.3.1. Bluetooth 2.4 GHz – Body Configuration 1g SISO (WF2)

Max Reported SAR = 0.308 (W/kg)

					WF2					
					Power (dBm)		1g: SAR Results (W/kg)			
Mod.	Dist (mm)	EUT Position	Channel Number	Freq. (MHz)	Tune Up Limit	Meas.	Meas. SAR Level	Reported SAR	Note(s)	Scan No.
GFSK (BDR)	0.0	Back	78	2480.0	12.00	10.80	0.234	0.308	-	27
GFSK (BDR)	0.0	Display Side	78	2480.0	12.00	10.80	0.006	0.008	-	28

10.4. 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 5.0GHz	1.140	U-NII	13.75	1.00
		1.140			

10.5. Highest Standalone Reported SAR:

Individual Transmitter Evaluation per Band: Wi-Fi

Exposure Configuration	Technology Band	Highest Reported 1g -SAR (W/Kg)	Equipment Class	Max Rated Source base Avg Power + Max Tolerance [dBm]	Highest Reported 1g -SAR (W/Kg)
BODY (Separation Distance 0mm)	WLAN 2.4GHz	0.824	DTS	16.75	0.824
	WLAN 5.0GHz	1.140	U-NII	13.75	1.140
	Bluetooth	0.308	DSS	12.00	0.308

11. Simultaneous Transmission Analysis

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

#	Simultaneous Transmission Conditions						
	WLAN						WPAN
	Wi-Fi 802.11b/g/n (2.4 GHz)			Wi-Fi 802.11a/n/ac (5.0 GHz)			*BT*
	SISO		MIMO	SISO		MIMO	SISO
	WF1	WF2	WF1+ WF2	WF1	WF2	WF1 + WF2	WF2
1	x						X
2				x			X
3					x		X
4						x	X

11.1.Simultaneous Transmission SAR Analysis

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

Worst Case Simultaneous Transmission SAR Analysis:

Exposure Configuration	Case(s)	Technology Band	Highest Reported 1g SAR (W/kg)	Equipment Class	Max Rated Source base Avg Power + Max Tolerance [dBm]	Highest Reported Sum-SAR 1g-SAR (W/kg)	SPLSR Ratio
BODY (Separation Distance 0mm)	1	WLAN 2.4GHz	0.463	DTS	16.75	0.771	N/A
		Bluetooth	0.308	DSS	12.00		
	2	WLAN 5.0GHz	1.049	U-NII	13.75	1.357	N/A
		Bluetooth	0.308	DSS	12.00		
	3	WLAN 5.0GHz	0.992	U-NII	13.75	1.300	N/A
		Bluetooth	0.308	DSS	12.00		
	4	WLAN 5.0GHz	1.140	U-NII	13.75	1.448	N/A
		Bluetooth	0.308	DSS	12.00		