



SAR EVALUATION REPORT

IEEE Std 1528-2013

For
Verifier Sentry 2.0

FCC ID: JQ6-SENTRY2Z
Model Name: SENTRY2Z

Report Number: R14122222-S1V3
Issue Date: 3/28/2023

Prepared for
HID Global Corporation
3950 RCA Blvd, Suite 5001
Palm Beach Gardens, FL 33410, United States

Prepared by
UL LLC
12 LABORATORY DR
RTP, NC 27709, U.S.A.
TEL: (919) 549-1400



Revision History

Rev.	Date	Revisions	Revised By
V1	2/18/2023	Initial Issue	--
V2	3/16/2023	Added NFC to § 1, 10, and 12, 13 MHz equipment in § 4.3 and 13 MHz system verification information in § 8	Richard Jankovics
V3	3/28/2023	Added NFC antenna to Appendix A, Antenna Dimensions & Separation Distances.	Richard Jankovics

Table of Contents

1.	Attestation of Test Results	5
2.	Test Specification, Methods and Procedures.....	6
3.	Facilities and Accreditation	7
4.	SAR Measurement System & Test Equipment	8
4.1.	<i>SAR Measurement System.....</i>	8
4.2.	<i>SAR Scan Procedures.....</i>	9
4.3.	<i>Test Equipment.....</i>	11
5.	Measurement Uncertainty.....	12
6.	Device Under Test (DUT) Information	13
6.1.	<i>DUT Description</i>	13
6.2.	<i>Wireless Technologies.....</i>	13
7.	RF Exposure Conditions (Test Configurations).....	14
7.1.	<i>Standalone SAR Test Exclusion Considerations.....</i>	14
7.2.	<i>Required Test Configurations</i>	15
8.	Dielectric Property Measurements & System Check	16
8.1.	<i>Dielectric Property Measurements</i>	16
8.2.	<i>System Check.....</i>	19
9.	Conducted Output Power Measurements.....	21
9.1.	<i>Wi-Fi 2.4GHz (DTS Band)</i>	21
9.2.	<i>Wi-Fi 5GHz (U-NII Bands).....</i>	24
10.	Measured and Reported (Scaled) SAR Results.....	28
10.1.	<i>Wi-Fi (DTS Band).....</i>	29
10.2.	<i>Wi-Fi (U-NII Band).....</i>	30
10.3.	<i>NFC.....</i>	32
11.	SAR Measurement Variability.....	33
12.	Simultaneous Transmission Conditions	35
12.1.	<i>Simultaneous transmission SAR test exclusion considerations</i>	35
12.2.	<i>Estimated SAR for Simultaneous Transmission SAR Analysis</i>	36
12.3.	<i>Sum of the SAR</i>	37
Appendixes		38
	<i>Appendix A: SAR Setup Photos</i>	38
	<i>Appendix B: SAR System Check Plots.....</i>	38

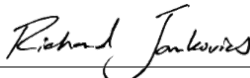
Appendix C: SAR Highest Test Plots..... 38

Appendix D: SAR Tissue Ingredients..... 38

Appendix E: SAR Probe Certificates..... 38

Appendix F: SAR Dipole Certificates 38

1. Attestation of Test Results

Applicant Name		HID Global Corporation			
FCC ID		JQ6-SENTRY2Z			
Model Name		SENTRY2Z			
Applicable Standards		Published RF exposure KDB procedures IEEE Std 1528-2013			
Exposure Category		SAR Limits (W/Kg)			
		Peak spatial-average (1g of tissue)		Extremities (hands, wrists, ankles, etc.) (10g of tissue)	
General population / Uncontrolled exposure		1.6		4.0	
RF Exposure Conditions		Equipment Class - Highest Reported SAR (W/kg)			
		DTS	NII	DSS	NFC
Body		1.085	1.363	0.084	N/A
Extremity		0.211	0.518	0.007	0.038
Simultaneous Tx	Body	1.450	1.482	1.371	N/A
	Extremity	0.634	0.971	0.460	0.971
Date Tested		11/21/2022 to 3/1/2023			
Test Results		Pass			
UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report. This report contains data provided by the customer which can impact the validity of results. UL LLC is only responsible for the validity of results after the integration of the data provided by the customer. The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise. This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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 A2LA, NIST, or any agency of the U.S. Government, or any agency of the U.S. government.					
Approved & Released By:			Prepared By:		
					
Devin Chang Senior Test Engineer UL Verification Services			Richard Jankovics Operations Leader UL LLC		

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE Std 1528-2013, the following FCC Published RF exposure [KDB](#) procedures:

- 248227 D01 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 447498 D03 Supplement C Cross-Reference v01
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02

In addition to the above, the following information was used:

- TCB Workshop October 2016; RF Exposure Procedures (DUT Holder Perturbations)
- TCB Workshop May 2017; RF Exposure Procedures (Handheld RFID/Barcode Scanners)
- TCB Workshop April 2019; RF Exposure Procedures (Tissue Simulating Liquids (TSL))

3. Facilities and Accreditation

UL LLC is accredited by A2LA, cert. # 0751.06 for all testing performed within the scope of this report. Testing was performed at the locations noted below.

The test sites and measurement facilities used to collect data are located at 2800 Perimeter Park Dr, Morrisville, NC, USA.

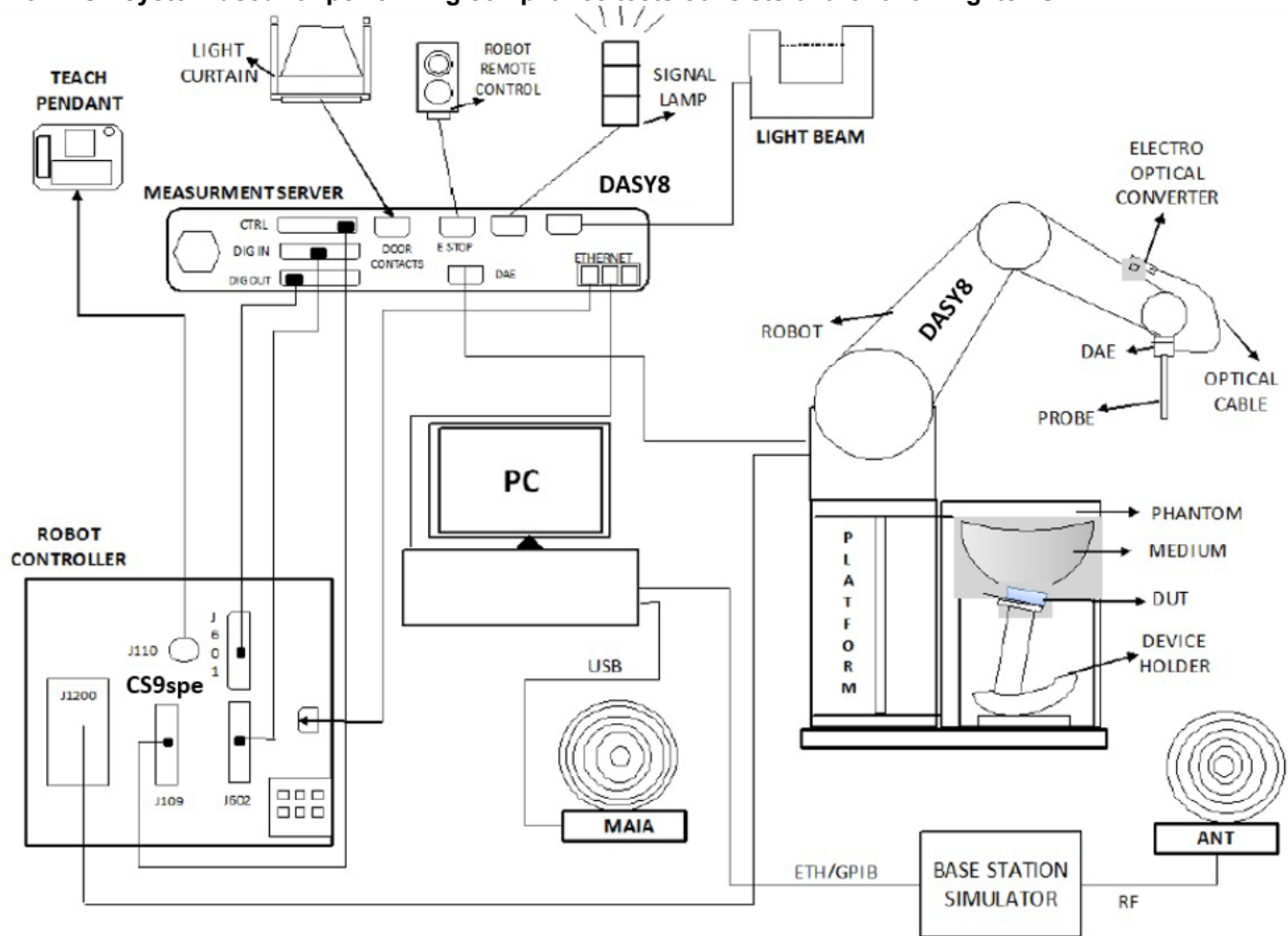
- SAR Lab 1A
- SAR Lab 2A
- SAR Lab 2B

	Address	ISED CABID	ISED Company Number	FCC Registration
☐	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	825374
☒	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A	US0067	27265	825374

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 Win10 and the DASY8¹ 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.

¹ DASY8 software used: DASY16.2.2.1588 and older generations.

4.2. SAR Scan Procedures

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEC/IEEE 62209-1528, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: $\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$	≤ 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 $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$			≤ 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: $\Delta z_{\text{Zoom}}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{\text{Zoom}}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{\text{Zoom}}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.				
* When zoom scan is required and the <u>reported</u> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

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.

Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Keysight	E5063A	MY54100681	9/30/2023
Dielectric Probe	SPEAG	DAKS-3.5	1147	3/13/2023
Shorting Block	SPEAG	DAK-3.5 Short	SM DAK 200 DB	3/13/2023
Dielectric Probe	SPEAG	DAKS-12	1038	3/14/2023
Shorting Block	SPEAG	DAK-12 Short	2044	3/14/2023
Thermometer	Fisher Scientific	15-078-181	210204689	3/13/2023

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Signal Generator	Keysight	N5181A	MY50140788	1/12/2024
3-Path Diode Power Sensor	Rohde & Schwarz	NRP8S	112236	5/31/2023
3-Path Diode Power Sensor	Rohde & Schwarz	NRP8S	112237	5/31/2023
Amplifier	MITEQ	AMF-4D-00400600-50-30P	N/A	N/A
Directional coupler	Mini-Circuits	ZUDC10-183+	1438	NA
DC Power Supply	Miteq	PS 15V1	1990186	N/A
RF Power Source	Speag	PowerSource1	4278	6/21/2023

Lab Equipment

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
E-Field Probe (SAR 1A)	SPEAG	EX3DV4	7711	3/11/2023
E-Field Probe (SAR 1A)	SPEAG	EX3DV4	7710	2/3/2024
E-Field Probe (SAR 2A)	SPEAG	EX3DV4	7587	4/27/2023
E-Field Probe (SAR 2B)	SPEAG	EX3DV4	7709	2/25/2023
Data Acquisition Electronics (SAR 1A)	SPEAG	DAE4	1716	3/8/2023
Data Acquisition Electronics (SAR 1A)	SPEAG	DAE4	1715	1/23/2024
Data Acquisition Electronics (SAR 2A)	SPEAG	DAE4	1673	9/15/2023
Data Acquisition Electronics (SAR 2B) ¹	SPEAG	DAE4	1714	2/23/2023
System Validation Dipole	SPEAG	CLA13	1017	3/9/2023
System Validation Dipole	SPEAG	D2450V2	963	10/18/2023
System Validation Dipole	SPEAG	D5GHzV2	1213	10/11/2023

Other

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
RF Power Meter	Keysight	N1912a	MY55136012	8/30/2023
RF Power Meter	Keysight	N1912a	MY55116004	9/2/2023
RF Power Sensor ¹	Keysight	N1921a	MY55090047	12/17/2022

Note(s):

- Equipment not used past calibration due date.

5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be $\leq 30\%$, for a confidence interval of $k = 2$. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEC/IEEE 62209-1528 is not required in SAR reports submitted for equipment approval.

Therefore, the measurement uncertainty is not required.

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Overall (Length x Width x Depth): 202.5 mm x 107 mm x 55.5 mm Overall with Fingerprint Scanner Extended (Length x Width x Depth): 256 mm x 107 mm x 55.5 mm Overall Diagonal: 192.5 mm Display Diagonal: 119 mm This is a Handheld device		
Back Cover	The Back Cover is not removable		
Battery Options	Standard – Lithium-ion battery, Rating 3.7 Vdc, 17.1 Wh		
Accessory	None		
Test sample information	S/N	IMEI	Notes
	21172522506714	N/A	SAR / Radiated
	21172522506711	N/A	SAR / Conducted
Hardware Version	01-30-04.00-OG-U02-STD		
Software Version	Android 8.1.0		

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20) 802.11n (HT40)	99.0% _(802.11b)
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT20) 802.11ac (VHT40) 802.11ac (VHT80)	90.3% _(802.11n/ac 40MHz BW) 85.3% _(802.11ac 80MHz BW)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No		
	Does this device support Band gap channel(s)? ☐ Yes ☒ No		
Bluetooth	2.4 GHz	BR, EDR, and LE	N/A ¹
NFC	13.56 MHz	ASK	N/A ¹

Notes:

1. Measured Duty Cycle is not required due to SAR test exemption.

7. RF Exposure Conditions (Test Configurations)

Refer to Appendix A for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

7.1. Standalone SAR Test Exclusion Considerations

Since the *Dedicated Host Approach* is applied, the standalone SAR test exclusion procedure in KDB 447498 § 4.3.1 is applied in conjunction with KDB 616217 § 4.3 to determine the minimum test separation distance:

- When the separation distance from the antenna to an adjacent edge is ≤ 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
- When the separation distance from the antenna to an adjacent edge is > 5 mm, the actual antenna-to-edge separation distance is applied to determine SAR test exclusion.

SAR Test Exclusion Calculations for WLAN

Antennas < 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Back ¹	Top	Right	Bottom	Left	Front	Back ¹	Top	Right	Bottom	Left	Front
Antenna 1															
Wi-Fi 2.4 GHz	2462	23.00	200	24.5	38.5	80.7	111.9	16.5	4	12.6 -MEASURE-	8 -MEASURE-	> 50 mm	> 50 mm	18.5 -MEASURE-	62.8 -MEASURE-
Wi-Fi 5.2 GHz	5240	20.50	112	24.5	38.5	80.7	111.9	16.5	4	10.3 -MEASURE-	6.6 -MEASURE-	> 50 mm	> 50 mm	15.1 -MEASURE-	51.3 -MEASURE-
Wi-Fi 5.3 GHz	5320	20.50	112	24.5	38.5	80.7	111.9	16.5	4	10.3 -MEASURE-	6.6 -MEASURE-	> 50 mm	> 50 mm	15.2 -MEASURE-	51.7 -MEASURE-
Wi-Fi 5.5 GHz	5700	20.50	112	24.5	38.5	80.7	111.9	16.5	4	10.7 -MEASURE-	6.9 -MEASURE-	> 50 mm	> 50 mm	15.7 -MEASURE-	53.5 -MEASURE-
Wi-Fi 5.8 GHz	5825	20.50	112	24.5	38.5	80.7	111.9	16.5	4	10.8 -MEASURE-	6.9 -MEASURE-	> 50 mm	> 50 mm	15.9 -MEASURE-	54.1 -MEASURE-
Bluetooth	2480	2.00	2	24.5	38.5	80.7	111.9	16.5	4	0.1 -EXEMPT-	0.1 -EXEMPT-	> 50 mm	> 50 mm	0.2 -EXEMPT-	0.6 -EXEMPT-
Antenna 2															
Wi-Fi 2.4 GHz	2462	23.00	200	24.5	38.5	16.5	111.9	80.7	4	12.6 -MEASURE-	8 -MEASURE-	18.5 -MEASURE-	> 50 mm	> 50 mm	62.8 -MEASURE-
Wi-Fi 5.2 GHz	5240	20.50	112	24.5	38.5	16.5	111.9	80.7	4	10.3 -MEASURE-	6.6 -MEASURE-	15.1 -MEASURE-	> 50 mm	> 50 mm	51.3 -MEASURE-
Wi-Fi 5.3 GHz	5320	20.50	112	24.5	38.5	16.5	111.9	80.7	4	10.3 -MEASURE-	6.6 -MEASURE-	15.2 -MEASURE-	> 50 mm	> 50 mm	51.7 -MEASURE-
Wi-Fi 5.5 GHz	5700	20.50	112	24.5	38.5	16.5	111.9	80.7	4	10.7 -MEASURE-	6.9 -MEASURE-	15.7 -MEASURE-	> 50 mm	> 50 mm	53.5 -MEASURE-
Wi-Fi 5.8 GHz	5825	19.50	89	24.5	38.5	16.5	111.9	80.7	4	8.6 -MEASURE-	5.5 -MEASURE-	12.6 -MEASURE-	> 50 mm	> 50 mm	43 -MEASURE-

Note(s):

- Extremity (hand) exposure condition.
- According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.

Antennas > 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Back ¹	Top	Right	Bottom	Left	Front	Back ¹	Top	Right	Bottom	Left	Front
WLAN/BT Antenna 1															
Wi-Fi 2.4 GHz	2462	23.00	200	24.5	38.5	80.7	111.9	16.5	4	< 50 mm	< 50 mm	402.6 mW -EXEMPT-	714.6 mW -EXEMPT-	< 50 mm	< 50 mm
Wi-Fi 5.2 GHz	5240	20.50	112	24.5	38.5	80.7	111.9	16.5	4	< 50 mm	< 50 mm	372.5 mW -EXEMPT-	684.5 mW -EXEMPT-	< 50 mm	< 50 mm
Wi-Fi 5.3 GHz	5320	20.50	112	24.5	38.5	80.7	111.9	16.5	4	< 50 mm	< 50 mm	372 mW -EXEMPT-	684 mW -EXEMPT-	< 50 mm	< 50 mm
Wi-Fi 5.5 GHz	5700	20.50	112	24.5	38.5	80.7	111.9	16.5	4	< 50 mm	< 50 mm	369.8 mW -EXEMPT-	681.8 mW -EXEMPT-	< 50 mm	< 50 mm
Wi-Fi 5.8 GHz	5825	20.50	112	24.5	38.5	80.7	111.9	16.5	4	< 50 mm	< 50 mm	369.2 mW -EXEMPT-	681.2 mW -EXEMPT-	< 50 mm	< 50 mm
Bluetooth	2480	2.00	2	24.5	38.5	80.7	111.9	16.5	4	< 50 mm	< 50 mm	402.3 mW -EXEMPT-	714.3 mW -EXEMPT-	< 50 mm	< 50 mm
WLAN Antenna 2															
Wi-Fi 2.4 GHz	2462	23.00	200	24.5	38.5	16.5	111.9	80.7	4	< 50 mm	< 50 mm	< 50 mm	714.6 mW -EXEMPT-	402.6 mW -EXEMPT-	< 50 mm
Wi-Fi 5.2 GHz	5240	20.50	112	24.5	38.5	16.5	111.9	80.7	4	< 50 mm	< 50 mm	< 50 mm	684.5 mW -EXEMPT-	372.5 mW -EXEMPT-	< 50 mm
Wi-Fi 5.3 GHz	5320	20.50	112	24.5	38.5	16.5	111.9	80.7	4	< 50 mm	< 50 mm	< 50 mm	684 mW -EXEMPT-	372 mW -EXEMPT-	< 50 mm
Wi-Fi 5.5 GHz	5700	20.50	112	24.5	38.5	16.5	111.9	80.7	4	< 50 mm	< 50 mm	< 50 mm	681.8 mW -EXEMPT-	369.8 mW -EXEMPT-	< 50 mm
Wi-Fi 5.8 GHz	5825	19.50	89	24.5	38.5	16.5	111.9	80.7	4	< 50 mm	< 50 mm	< 50 mm	681.2 mW -EXEMPT-	369.2 mW -EXEMPT-	< 50 mm

Note(s):

- Extremity (hand) exposure condition.
- According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.

7.2. Required Test Configurations

The table below identifies the standalone test configurations required for this device according to the findings in Section 7.1:

Test Configurations	Back	Back (Fingerprint Scanner Extended)	Front	Edge 1	Edge 2	Edge 3	Edge 4
				(Top Edge)	(Right Edge)	(Bottom Edge)	(Left Edge)
Wi-Fi 2.4 GHz (WLAN/BT Antenna 1)	Yes	Yes	Yes	Yes	Yes ¹	No	Yes
Wi-Fi 2.4 GHz (WLAN Antenna 2)	Yes	Yes	Yes	Yes	Yes	No	Yes ¹
Wi-Fi 5.2 GHz (WLAN/BT Antenna 1)	Yes	Yes	Yes	Yes	Yes ¹	No	Yes
Wi-Fi 5.2 GHz (WLAN Antenna 2)	Yes	Yes	Yes	Yes	Yes	No	Yes ¹
Wi-Fi 5.3 GHz (WLAN/BT Antenna 1)	Yes	Yes	Yes	Yes	Yes ¹	No	Yes
Wi-Fi 5.3 GHz (WLAN Antenna 2)	Yes	Yes	Yes	Yes	Yes	No	Yes ¹
Wi-Fi 5.5 GHz (WLAN/BT Antenna 1)	Yes	Yes	Yes	Yes	Yes ¹	No	Yes
Wi-Fi 5.5 GHz (WLAN Antenna 2)	Yes	Yes	Yes	Yes	Yes	No	Yes ¹
Wi-Fi 5.8 GHz (WLAN/BT Antenna 1)	Yes	Yes	Yes	Yes	Yes ¹	No	Yes
Wi-Fi 5.8 GHz (WLAN Antenna 2)	Yes	Yes	Yes	Yes	Yes	No	Yes ¹
Bluetooth	No	No	No	No	No	No	No
NFC	Yes	Yes	No	No	No	No	No

Note(s):

Yes = Testing is required.

No = Testing is not required.

- For simultaneous considerations, left and right edges were measured for WLAN despite meeting exemption thresholds.

8. Dielectric Property Measurements & System Check

8.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within $\pm 2^\circ\text{C}$ 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.

The dielectric constant (ϵ_r) and conductivity (σ) of typical tissue-equivalent media recipes are expected to be within $\pm 5\%$ of the required target values; but for SAR measurement systems that have implemented the SAR error compensation algorithms documented in IEC/IEEE 62209-1528, to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters, the tolerance for ϵ_r and σ may be relaxed to $\pm 10\%$. This is limited to frequencies $\leq 3\text{ GHz}$.

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	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
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
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
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
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
5800	35.3	5.27	48.2	6.00

IEC/IEEE 62209-1528

Table 2 – Dielectric properties of the tissue-equivalent medium

Frequency MHz	Real part of the complex relative permittivity, ϵ_r'	Conductivity, σ S/m	Penetration depth (E-field), δ mm
4	55,0	0,75	293,0
13	55,0	0,75	165,5
30	55,0	0,75	112,8
150	52,3	0,76	62,0
300	45,3	0,87	46,1
450	43,5	0,87	43,0
750	41,9	0,89	39,8
835	41,5	0,90	39,0
900	41,5	0,97	36,2
1 450	40,5	1,20	28,6
1 800	40,0	1,40	24,3
1 900	40,0	1,40	24,3
1 950	40,0	1,40	24,3
2 000	40,0	1,40	24,3
2 100	39,8	1,49	22,8
2 450	39,2	1,80	18,7
2 600	39,0	1,96	17,2
3 000	38,5	2,40	14,0
3 500	37,9	2,91	11,4
4 000	37,4	3,43	10,0
4 500	36,8	3,94	9,7
5 000	36,2	4,45	1,5
5 200	36,0	4,66	8,4
5 400	35,8	4,86	8,1
5 600	35,5	5,07	7,5
5 800	35,3	5,27	7,3
6 000	35,1	5,48	7,0
6 500	34,5	6,07	6,7
7 000	33,9	6,65	6,4
7 500	33,3	7,24	6,1
8 000	32,7	7,84	5,9
8 500	32,1	8,46	5,3
9 000	31,6	9,08	4,8
9 500	31,0	9,71	4,4
10 000	30,4	10,40	4,0

NOTE For convenience, permittivity and conductivity values are linearly interpolated for frequencies that are not a part of the original data from Drossos et al. [2]. They are shown in italics in Table 2. The italicized values are linearly interpolated (below 5800 MHz) or extrapolated (above 5800 MHz) from the non-italicized values that are immediately above and below these values.

Dielectric Property Measurements Results:

SAR Lab	Date	Band (MHz)	Tissue Type	Frequency (MHz)	Relative Permittivity (ϵ_r)			Conductivity (σ)		
					Measured	Target	Delta (%)	Measured	Target	Delta (%)
1A	11/17/2022	2450	Head	2450	40.80	39.20	4.08	1.84	1.80	2.17
				2400	40.86	39.30	3.98	1.80	1.75	2.59
				2480	40.77	39.16	4.11	1.86	1.83	1.45
1A	11/23/2022	2450	Head	2450	40.58	39.20	3.52	1.85	1.80	3.00
				2400	40.65	39.30	3.44	1.81	1.75	3.50
				2480	40.53	39.16	3.49	1.87	1.83	2.27
1A	11/28/2022	2450	Head	2450	40.50	39.20	3.32	1.84	1.80	2.28
				2400	40.56	39.30	3.21	1.80	1.75	2.76
				2480	40.46	39.16	3.31	1.86	1.83	1.61
1A	11/28/2022	5250	Head	5250	35.82	35.93	-0.31	4.59	4.70	-2.32
				5150	36.01	36.05	-0.10	4.48	4.60	-2.63
				5350	35.64	35.82	-0.50	4.71	4.80	-2.05
1A	11/28/2022	5600	Head	5600	35.22	35.53	-0.88	4.99	5.06	-1.41
				5500	35.40	35.65	-0.70	4.87	4.96	-1.77
				5725	35.00	35.39	-1.11	5.14	5.19	-0.95
1A	11/28/2022	5750	Head	5750	34.97	35.36	-1.11	5.16	5.21	-0.95
				5700	35.03	35.42	-1.10	5.11	5.16	-1.04
				5850	34.79	35.30	-1.44	5.28	5.27	0.21
1A	12/5/2022	5750	Head	5750	33.81	35.36	-4.39	5.15	5.21	-1.24
				5700	33.88	35.42	-4.35	5.10	5.16	-1.27
				5850	33.63	35.30	-4.73	5.26	5.27	-0.15
1A	12/19/2022	2450	Head	2450	39.75	39.20	1.40	1.84	1.80	2.33
				2400	39.85	39.30	1.41	1.80	1.75	2.93
				2480	39.70	39.16	1.37	1.84	1.83	0.52
1A	12/19/2022	5250	Head	5250	35.06	35.93	-2.43	4.52	4.70	-3.83
				5150	35.25	36.05	-2.21	4.47	4.60	-2.91
				5350	34.87	35.82	-2.65	4.71	4.80	-1.95
1A	12/19/2022	5600	Head	5600	34.56	35.53	-2.74	4.96	5.06	-2.02
				5500	34.82	35.65	-2.32	4.90	4.96	-1.23
				5725	34.23	35.39	-3.28	5.18	5.19	-0.12
1A	12/19/2022	5750	Head	5750	34.30	35.36	-3.01	5.18	5.21	-0.63
				5700	34.18	35.42	-3.50	5.18	5.16	0.26
				5850	34.13	35.30	-3.31	5.20	5.27	-1.25
1A	3/1/2023	13	Head	13	54.87	55.00	-0.24	0.72	0.75	-4.67
				12	54.90	55.00	-0.18	0.71	0.75	-4.68
				14	54.83	55.00	-0.31	0.72	0.75	-4.67
2A	2/6/2023	5250	Head	5250	35.75	35.93	-0.51	4.65	4.70	-1.11
				5150	35.94	36.05	-0.30	4.54	4.60	-1.39
				5350	35.55	35.82	-0.75	4.76	4.80	-0.88
2A	2/6/2023	5600	Head	5600	35.10	35.53	-1.22	5.05	5.06	-0.30
				5500	35.29	35.65	-1.00	4.93	4.96	-0.64
				5725	34.85	35.39	-1.53	5.20	5.19	0.15
2A	2/6/2023	5750	Head	5750	34.81	35.36	-1.56	5.23	5.21	0.27
				5700	34.91	35.42	-1.44	5.16	5.16	0.03
				5850	34.63	35.30	-1.90	5.34	5.27	1.35
2B	2/8/2023	2450	Head	2450	39.15	39.20	-0.13	1.87	1.80	3.94
				2400	39.33	39.30	0.08	1.81	1.75	3.50
				2480	39.06	39.16	-0.26	1.90	1.83	3.69

8.2. 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.

System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ± 0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 50 mW.
- The results are normalized to 1 W input power.

System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within $\pm 10\%$ of the manufacturer calibrated dipole SAR target. Refer to Appendix B for the SAR System Check Plots.

SAR Lab	Date	Tissue Type	Dipole Type_Serial #	Dipole Cal. Due Date	Dipole Power (dBm)	Measured Results for 1g SAR				Measured Results for 10g SAR				Plot No.
						Zoom Scan	Normalize to 1 W	Target (Ref. Value)	Delta $\pm 10\%$	Zoom Scan	Normalize to 1 W	Target (Ref. Value)	Delta $\pm 10\%$	
1A	11/17/2022	Head	D2450V2 SN: 963	10/18/2023	17.00	2.420	48.29	52.40	-7.85	1.140	22.75	24.50	-7.16	1
1A	11/18/2022	Head	D2450V2 SN: 963	10/18/2023	17.00	2.740	54.67	52.40	4.33	1.280	25.54	24.50	4.24	
1A	11/23/2022	Head	D2450V2 SN: 963	10/18/2023	17.00	2.560	51.08	52.40	-2.52	1.200	23.94	24.50	-2.27	
1A	11/28/2022	Head	D2450V2 SN: 963	10/18/2023	17.00	2.560	51.08	52.40	-2.52	1.200	23.94	24.50	-2.27	
1A	11/28/2022	Head	D5GHzV2 SN: 1213 (5.25 GHz)	10/11/2023	17.00	3.990	79.61	79.40	0.27	1.130	22.55	22.70	-0.68	
1A	11/28/2022	Head	D5GHzV2 SN: 1213 (5.60 GHz)	10/11/2023	17.00	4.370	87.19	82.40	5.82	1.220	24.34	23.50	3.58	2
1A	11/28/2022	Head	D5GHzV2 SN: 1213 (5.75 GHz)	10/11/2023	17.00	3.940	78.61	78.80	-0.24	1.100	21.95	22.40	-2.02	
1A	12/5/2022	Head	D5GHzV2 SN: 1213 (5.75 GHz)	10/11/2023	17.00	3.980	79.41	78.80	0.78	1.130	22.55	22.40	0.65	
1A	12/19/2022	Head	D2450V2 SN: 963	10/18/2023	17.00	2.560	51.08	52.40	-2.52	1.190	23.74	24.50	-3.09	
1A	12/19/2022	Head	D5GHzV2 SN: 1213 (5.60 GHz)	10/11/2023	17.00	4.250	84.80	82.40	2.91	1.200	23.94	23.50	1.89	
1A	12/19/2022	Head	D5GHzV2 SN: 1213 (5.25 GHz)	10/11/2023	17.00	3.840	76.62	79.40	-3.50	1.110	22.15	22.70	-2.43	
1A	12/19/2022	Head	D5GHzV2 SN: 1213 (5.75 GHz)	10/11/2023	17.00	3.770	75.22	78.80	-4.54	1.070	21.35	22.40	-4.69	
1A	3/1/2023	Head	CLA 13 SN: 1017	3/9/2023	16.00	0.021	0.53	0.57	-7.46	0.013	0.33	0.35	-6.70	3
2A	2/6/2023	Head	D5GHzV2 SN: 1213 (5.25 GHz)	10/11/2023	17.0	3.660	73.03	79.40	-8.03	1.050	20.95	22.70	-7.71	4
2A	2/6/2023	Head	D5GHzV2 SN: 1213 (5.60 GHz)	10/11/2023	17.0	3.960	79.01	82.40	-4.11	1.110	22.15	23.50	-5.76	
2A	2/6/2023	Head	D5GHzV2 SN: 1213 (5.75 GHz)	10/11/2023	17.0	3.590	71.63	78.80	-9.10	1.020	20.35	22.40	-9.14	5
2B	2/8/2023	Head	D2450V2 SN: 963	10/18/2023	17.00	2.530	50.48	52.40	-3.66	1.160	23.15	24.50	-5.53	6

9. Conducted Output Power Measurements

Tune-Up Power Limits provided by the manufacturer are used to scale measured SAR values.

9.1. Wi-Fi 2.4GHz (DTS Band)

Maximum Output Power (Tune-up Limit) for Wi-Fi 2.4 GHz

The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.

For “Not required”, SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11b/g/n mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band. Additional output power measurements were not deemed necessary.

According to KDB 248227 D01, simultaneous SAR provisions in KDB 447498 D01 apply to determine simultaneous transmission SAR test exclusion for Wi-Fi MIMO. If the sum of 1-g single transmission chain SAR measurements is $<1.6\text{W/kg}$ and/or the MIMO output power is equal or less than a single chain, then no additional SAR measurements for simultaneously at the specified maximum output power of MIMO operation.

SAR testing is not required for OFDM mode(s) when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is $\leq 1.2\text{ W/kg}$.

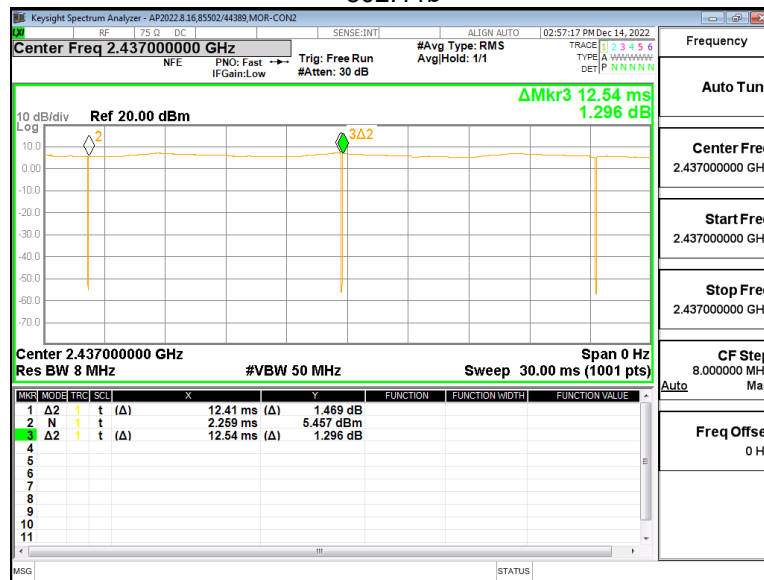
Mode	Bandwidth	Channel	Frequency (MHz)	Tune-up Power Limit (dBm)	
				Antenna 1	Antenna 2
				Maximum	Maximum
802.11b DSSS (SISO)	20 MHz	1	2412	23.0	15.5
		2	2417	23.0	21.0
		6	2437	23.0	23.0
		10	2457	23.0	23.0
		11	2462	20.0	21.5
802.11b DSSS (MIMO)	20 MHz	1	2412	15.0	15.0
		2	2417	21.0	21.0
		6	2437	23.0	23.0
		10	2457	21.5	21.5
		11	2462	20.5	20.5
802.11g OFDM (SISO)	20 MHz	1	2412	18.0	16.0
		2	2417	21.0	18.5
		6	2437	23.0	22.5
		10	2457	20.5	19.5
		11	2462	17.5	17.5
802.11g OFDM (MIMO)	20 MHz	1	2412	15.0	15.0
		2	2417	19.0	19.0
		6	2437	22.0	22.0
		10	2457	20.0	20.0
		11	2462	17.5	17.5
802.11n OFDM (SISO)	20 MHz	1	2412	17.5	14.0
		2	2417	20.5	18.5
		6	2437	23.0	22.5
		10	2457	20.5	19.5
		11	2462	16.0	17.0
802.11n OFDM (MIMO)	20 MHz	1	2412	15.0	15.0
		2	2417	18.5	18.5
		6	2437	22.0	22.0
		10	2457	19.5	19.5
		11	2462	16.5	16.5
802.11n OFDM (SISO)	40 MHz	1	2412	16.0	14.0
		2	2417	16.5	15.5
		6	2437	17.5	16.5
		10	2457	16.0	16.0
		11	2462	15.5	16.0
802.11n OFDM (MIMO)	40 MHz	1	2412	13.5	13.5
		2	2417	14.0	14.0
		6	2437	15.5	15.5
		10	2457	15.5	15.5
		11	2462	15.0	15.0
802.11ac OFDMA (SISO)	20 MHz	1	2412	17.5	14.0
		2	2417	20.5	18.5
		6	2437	23.0	22.5
		10	2457	20.5	19.5
		11	2462	16.0	17.0
802.11ac OFDMA (MIMO)	20 MHz	1	2412	15.0	15.0
		2	2417	18.5	18.5
		6	2437	22.0	22.0
		10	2457	19.5	19.5
		11	2462	16.5	16.5
802.11ac OFDMA (SISO)	40 MHz	1	2412	16.0	14.0
		2	2417	16.5	15.5
		6	2437	17.5	16.5
		10	2457	16.0	16.0
		11	2462	15.5	16.0
802.11ac OFDMA (MIMO)	40 MHz	1	2412	13.5	13.5
		2	2417	14.0	14.0
		6	2437	15.5	15.5
		10	2457	15.5	15.5
		11	2462	15.0	15.0

Band	Mode	Ch #	Freq. (MHz)	Antenna 1 Average Power (dBm)		Antenna 2 Average Power (dBm)			
				Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
DSSS 2.4 GHz	802.11b	1	2412	22.8	23.0	Yes	15.4	15.5	Yes
		2	2417	22.8	23.0		20.8	21.0	
		3	2422				22.9	23.0	
		6	2437	22.8	23.0		23.0	23.0	
		10	2457	22.7	23.0		22.9	23.0	
		11	2462	19.9	20.0		21.2	21.5	

Mode	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
802.11b	12.41	12.54	99.0%	1.01

$$\text{Duty Cycle} = (T_{\text{on}} / \text{period}) * 100\%$$

802.11b



9.2. Wi-Fi 5GHz (U-NII Bands)

Maximum Output Power (Tune-up Limit) for Wi-Fi 5 GHz

When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac/ modes, the channel in the lower order/sequence 802.11 transmission mode is selected.

The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.

For “Not required”, SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac/ mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band. Additional output power measurements were not deemed necessary.

According to KDB 248227 D01, simultaneous SAR provisions in KDB 447498 D01 apply to determine simultaneous transmission SAR test exclusion for Wi-Fi MIMO. If the sum of 1-g single transmission chain SAR measurements is $<1.6\text{W/kg}$ and/or the MIMO output power is equal or less than a single chain, then no additional SAR measurements for simultaneously at the specified maximum output power of MIMO operation.

When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is $\leq 1.2\text{ W/kg}$, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.

Mode	Bandwidth	Channel	Frequency (MHz)	Tune-up Power Limit (dBm)	
				Antenna 1	Antenna 2
				Maximum	Maximum
U-NII-1 5.2 GHz	802.11a/n/ac 20 MHz	36	5180	20.5	20.5
		40	5200	20.5	20.5
		44	5220	20.5	20.5
		48	5240	20.5	20.5
	802.11n/ac 40 MHz	38	5190	15.5	16.0
		46	5230	20.5	20.5
	802.11ac 80 MHz	42	5210	16.5	15.5
U-NII-2A 5.3 GHz	802.11a/n/ac 20 MHz	52	5260	20.5	20.5
		56	5280	20.5	20.5
		60	5300	20.5	20.5
		64	5320	20.5	20.0
	802.11n/ac 40 MHz	54	5270	20.5	20.5
		62	5310	15.5	15.5
	802.11ac 80 MHz	58	5290	14.5	20.5
U-NII-2C 5.5 GHz	802.11a/n/ac 20 MHz	100	5500	20.5	20.5
		116	5580	20.5	20.5
		124	5620	20.5	20.5
		132	5660	20.5	20.5
		144	5720	20.5	20.5
	802.11n/ac 40 MHz	102	5510	17.0	16.0
		110	5550	20.5	20.5
		126	5630	20.5	20.5
		134	5670	18.0	20.5
		142	5710	20.5	20.5
	802.11ac 80 MHz	106	5530	15.5	15.5
		122	5610	20.0	20.5
		138	5690	20.5	20.5
U-NII-3 5.8 GHz	802.11a/n/ac 20 MHz	149	5745	20.5	19.5
		157	5785	20.5	19.5
		165	5825	20.5	19.5
	802.11n/ac 40 MHz	151	5755	20.5	19.5
		159	5795	20.5	19.5
	802.11ac 80 MHz	155	5775	20.5	19.5

Wi-Fi 5 GHz Measured Results

Band	Mode	Ch #	Freq. (MHz)	Antenna 1 Average Power (dBm)			Antenna 2 Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-1 5.2 GHz	802.11n (HT40)	38	5190	15.3	15.5	Yes	15.5	16.0	Yes
		46	5230	20.4	20.5		20.4	20.5	
Band	Mode	Ch #	Freq. (MHz)	Antenna 1 Average Power (dBm)			Antenna 2 Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-2A 5.3 GHz	802.11n (HT40)	54	5270	20.0	20.5	Yes			
		62	5310	15.1	15.5				
	802.11ac (VHT80)	58	5290				20.2	20.5	Yes
Band	Mode	Ch #	Freq. (MHz)	Antenna 1 Average Power (dBm)			Antenna 2 Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-2C 5.5 GHz	802.11ac (VHT80)	106	5530	15.1	15.5	Yes	15.0	15.5	Yes
		122	5610	19.7	20.0		20.1	20.5	
		138	5690	20.2	20.5		20.2	20.5	
Band	Mode	Ch #	Freq. (MHz)	Antenna 1 Average Power (dBm)			Antenna 2 Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-3 5.8 GHz	802.11ac (VHT80)	155	5775	20.3	20.5	Yes	19.3	19.5	Yes

Duty Factor Measured Results

Mode	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
802.11n HT40	0.945	1.047	90.3%	1.11
802.11ac VHT80	0.463	0.543	85.3%	1.17

Note(s):

Duty Cycle = (T on / period) * 100%

WLAN 5 GHz Duty Cycle

802.11n HT40



802.11ac VHT80



10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

- Reported SAR(W/kg) for Wi-Fi = Measured SAR * Tune-up scaling factor * Duty Cycle scaling factor
- Duty Cycle scaling factor = 1 / Duty cycle (%)

KDB 447498 D01 General RF Exposure Guidance:

Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

KDB 248227 D01 SAR meas for 802.11:

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the initial test position(s) by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The initial test position(s) is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the reported SAR for the initial test position is:

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- > 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions are tested.
 - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
 - When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required test channels are considered.
 - The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is ≤ 1.2 W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is ≤ 1.2 W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

To determine the initial test position, Area Scans were performed to determine the position with the *Maximum Value of SAR (measured)*. The position that produced the highest *Maximum Value of SAR* is considered the worst case position; thus used as the initial test position.

10.1. Wi-Fi (DTS Band)

When the 802.11b reported SAR of the highest measured maximum output power channel is ≤ 0.8 W/kg, no further SAR testing is required. If SAR is > 0.8 W/kg and ≤ 1.2 W/kg, SAR is required for the next highest measured output power channel. Finally, if SAR is > 1.2 W/kg, SAR is required for the third channel.

SAR testing is not required for OFDM mode(s) when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

WLAN 2.4 GHz Antenna 1

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	802.11b	Antenna 1	0	Front	6	2437	0.176	99.0%	23.0	22.8	0.142	0.149	1
				Top	6	2437	0.206	99.0%	23.0	22.8	0.164	0.172	
				Top Tilt	6	2437	0.228	99.0%	23.0	22.8	0.183	0.192	
				Left Edge	6	2437	0.504	99.0%	23.0	22.8	0.388	0.407	
				Right Edge	6	2437	0.101	99.0%	23.0	22.8	0.083	0.087	

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		10-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	802.11b	Antenna 1	0	Rear	6	2437	0.375	99.0%	23.0	22.8	0.171	0.179	2
				Rear: Fingerprint Scanner Extended	6	2437	0.427	99.0%	23.0	22.8	0.170	0.178	

WLAN 2.4 GHz Antenna 2

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	802.11b	Antenna 2	0	Front	6	2437	0.610	99.0%	23.0	23.0	0.496	0.504	
				Top	6	2437	0.209	99.0%	23.0	23.0	0.169	0.172	
				Top Tilt	6	2437	0.447	99.0%	23.0	23.0	0.367	0.373	
				Left Edge	6	2457	0.064	99.0%	23.0	23.0	0.049	0.050	
				Right Edge	3	2422	1.130	99.0%	23.0	22.9	0.880	0.905	
					6	2437	1.210	99.0%	23.0	23.0	0.972	0.989	
					10	2457	1.300	99.0%	23.0	22.9	1.040	1.085	

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		10-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	802.11b	Antenna 2	0	Rear	6	2437	0.445	99.0%	23.0	23.0	0.207	0.211	4
				Rear: Fingerprint Scanner Extended	6	2437	0.136	99.0%	23.0	23.0	0.070	0.071	

10.2. Wi-Fi (U-NII Band)

UNII-1 & 2A

When the specified maximum output power is the same for both UNII band I and UNII band 2A, begin SAR measurement in UNII band 2A; and if the highest reported SAR for UNII band 2A is

- ≤ 1.2 W/kg, SAR is not required for UNII band I
- > 1.2 W/kg, both bands should be tested independently for SAR.

WLAN 5.2 GHz Antenna 2

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	802.11n (HT40)	Antenna 2	0	Front	46	5230	0.579	90.3%	20.5	20.4	0.425	0.484	5
				Top	46	5230	1.430	90.3%	20.5	20.4	0.980	1.116	
				Top Tilt	46	5230	0.538	90.3%	20.5	20.4	0.438	0.499	
				Left Edge	46	5230	0.066	90.3%	20.5	20.4	0.048	0.054	
				Right Edge	46	5230	1.440	90.3%	20.5	20.4	1.040	1.184	

WLAN 5.3 GHz Antenna 1

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	802.11n (HT40)	Antenna 1	0	Front	54	5270	0.097	90.3%	20.5	20.0	0.061	0.075	6
				Top	54	5270	0.080	90.3%	20.5	20.0	0.056	0.069	
				Top Tilt	54	5270	0.102	90.3%	20.5	20.0	0.074	0.091	
				Left Edge	54	5270	1.080	90.3%	20.5	20.0	0.864	1.066	
				Right Edge	54	5270	0.105	90.3%	20.5	20.0	0.071	0.088	

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		10-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	802.11n (HT40)	Antenna 1	0	Rear	54	5270	1.210	90.3%	20.5	20.0	0.379	0.468	7
				Rear: Finger Print Scanner Extended	54	5270	1.340	90.3%	20.5	20.0	0.420	0.518	

WLAN 5.3 GHz Antenna 2

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	802.11ac (VHT80)	Antenna 2	0	Front	58	5290	0.705	85.3%	20.5	20.2	0.503	0.626	8
				Top	58	5290	1.230	85.3%	20.5	20.2	0.856	1.065	
				Top Tilt	58	5290	0.502	85.3%	20.5	20.2	0.405	0.504	
				Left Edge	58	5290	0.052	85.3%	20.5	20.2	0.036	0.045	
				Right Edge	58	5290	1.430	85.3%	20.5	20.2	1.020	1.270	

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		10-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	802.11ac (VHT80)	Antenna 2	0	Rear	58	5290	1.020	85.3%	20.5	20.2	0.266	0.331	9
				Rear: Finger Print Scanner Extended	58	5290	0.876	85.3%	20.5	20.2	0.272	0.339	

UNII-2C**WLAN 5.5 GHz Antenna 1**

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	802.11ac (VHT80)	Antenna 1	0	Front	138	5690	0.182	85.3%	20.5	20.2	0.133	0.168	
				Top	138	5690	0.111	85.3%	20.5	20.2	0.082	0.104	
				Top Tilt	138	5690	0.232	85.3%	20.5	20.2	0.196	0.248	
				Left Edge	138	5690	0.722	85.3%	20.5	20.2	0.598	0.756	10
				Right Edge	138	5690	0.119	85.3%	20.5	20.2	0.080	0.100	

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		10-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	802.11ac (VHT80)	Antenna 1	0	Rear	138	5690	0.734	85.3%	20.5	20.2	0.249	0.315	11
				Rear: Finger Print Scanner Extended	138	5690	0.695	85.3%	20.5	20.2	0.243	0.307	

WLAN 5.5 GHz Antenna 2

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	802.11ac (VHT80)	Antenna 2	0	Front	138	5690	0.609	85.3%	20.5	20.2	0.453	0.568	
				Top	138	5690	0.468	85.3%	20.5	20.2	0.364	0.456	
				Top Tilt	138	5690	0.338	85.3%	20.5	20.2	0.276	0.346	
				Left Edge	138	5690	0.055	85.3%	20.5	20.2	0.044	0.055	
				Right Edge	122	5610	1.430	85.3%	20.5	20.1	1.070	1.363	12
					138	5690	1.340	85.3%	20.5	20.2	1.060	1.328	

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		10-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	802.11ac (VHT80)	Antenna 2	0	Rear	138	5690	0.600	85.3%	20.5	20.2	0.165	0.207	
				Rear: Finger Print Scanner Extended	122	5610	0.806	85.3%	20.5	20.1	0.271	0.345	
					138	5690	1.080	85.3%	20.5	20.2	0.331	0.415	13

UNII-3**WLAN 5.8 GHz Antenna 1**

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	802.11ac (VHT80)	Antenna 1	0	Front	155	5775	0.398	85.3%	20.5	20.3	0.284	0.349	
				Top	155	5775	0.160	85.3%	20.5	20.3	0.118	0.145	
				Top Tilt	155	5775	0.368	85.3%	20.5	20.3	0.276	0.340	
				Left Edge	155	5775	0.720	85.3%	20.5	20.3	0.591	0.727	14
				Right Edge	155	5775	0.136	85.3%	20.5	20.3	0.097	0.119	

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		10-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	802.11ac (VHT80)	Antenna 1	0	Rear	155	5775	0.946	85.3%	20.5	20.3	0.301	0.370	15
				Rear: Finger Print Scanner Extended	155	5775	0.945	85.3%	20.5	20.3	0.298	0.367	

WLAN 5.8 GHz Antenna 2

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	802.11ac (VHT80)	Antenna 2	0	Front	155	5775	0.448	85.3%	19.5	19.3	0.318	0.395	
				Top	155	5775	0.474	85.3%	19.5	19.3	0.313	0.389	
				Top Tilt	155	5775	0.225	85.3%	19.5	19.3	0.197	0.245	
				Left Edge	155	5775	0.059	85.3%	19.5	19.3	0.042	0.052	
				Right Edge	155	5775	0.140	85.3%	19.5	19.3	0.939	1.166	16

RF Exposure Conditions	Mode	Antenna	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle	Power (dBm)		10-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Extremity	802.11ac (VHT80)	Antenna 2	0	Rear	155	5775	0.475	85.3%	19.5	19.3	0.116	0.144	
				Rear: Finger Print Scanner Extended	155	5775	0.898	85.3%	19.5	19.3	0.288	0.358	17

10.3. NFC

RF Exposure Conditions	Dist. (mm)	Freq. (MHz)	Mode	Tolerance Scaling ¹ (dB)	Test Position	10-g SAR (W/kg)		Plot No.
						Meas.	Scaled	
Extremity	0	13.56	No card; fingerprint scanner normal	2	Rear	0.001	0.002	
			Card in; fingerprint scanner normal	2	Front	0.024	0.038	18
			Card in; fingerprint scanner extended	2	Left	0.023	0.036	

Note(s):

- The SAR values for the NFC are not scaled for maximum production power because measurements of actual output power are not practical. The values were measured with the device operated within expected tolerances of the transmitter specifications and after accounting for production tolerances the contribution to the RF exposure budget from the NFC transmitter would remain negligible.

11. SAR Measurement Variability

In accordance with published RF Exposure KDB 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 < 0.8 or 2 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.8 or 2 W/kg (1-g or 10-g respectively), 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 or 3.6 W/kg (~ 10% from the 1-g or 10-g respective SAR limit).
- 4) Perform a third repeated measurement only if the original, first, or second repeated measurement is ≥ 1.5 or 3.75 W/kg (1-g or 10-g respectively) and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	First Repeated		Second Repeated		Third Repeated
						Measured SAR (W/kg)	Largest to Smallest SAR Ratio	Measured SAR (W/kg)	Largest to Smallest SAR Ratio	Measured SAR (W/kg)
Antenna 1										
2400	Wi-Fi 802.11b/g/n	Body	Edge Left	No	0.388	N/A	N/A	N/A	N/A	N/A
5200	Wi-Fi 802.11a/n/ac	Body	Edge Left	Yes	0.983	1.010	1.03	N/A	N/A	N/A
5300	Wi-Fi 802.11a/n/ac	Body	Edge Left	Yes	0.864	0.881	1.02	N/A	N/A	N/A
5500	Wi-Fi 802.11a/n/ac	Body	Edge Left	No	0.605	N/A	N/A	N/A	N/A	N/A
5800	Wi-Fi 802.11a/n/ac	Body	Edge Left	No	0.794	N/A	N/A	N/A	N/A	N/A
Antenna 2										
2400	Wi-Fi 802.11b/g/n	Body	Edge Right	Yes	1.040	1.020	1.02	N/A	N/A	N/A
5200	Wi-Fi 802.11a/n/ac	Body	Edge Right	Yes	1.040	1.040	1.00	N/A	N/A	N/A
5300	Wi-Fi 802.11a/n/ac	Body	Edge Right	Yes	1.020	0.992	1.03	N/A	N/A	N/A
5500	Wi-Fi 802.11a/n/ac	Body	Edge Right	Yes	1.070	1.08	1.01	N/A	N/A	N/A
5800	Wi-Fi 802.11a/n/ac	Body	Edge Right	Yes	0.939	0.954	1.02	N/A	N/A	N/A

Note(s):

Repeated measurement is not required since the original highest measured SAR is <0.8 W/kg (1-g) or 2 W/kg (10-g) .
 Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is < 1.20.

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	First Repeated		Second Repeated		Third Repeated
						Measured SAR (W/kg)	Largest to Smallest SAR Ratio	Measured SAR (W/kg)	Largest to Smallest SAR Ratio	Measured SAR (W/kg)
Antenna 1										
2400	Wi-Fi 802.11b/g/n	Extremity	Back	No	0.171	N/A	N/A	N/A	N/A	N/A
5200	Wi-Fi 802.11a/n/ac	Extremity	Back Fingerprint Scanner Extended	No	0.413	N/A	N/A	N/A	N/A	N/A
5300	Wi-Fi 802.11a/n/ac	Extremity	Back Fingerprint Scanner Extended	No	0.420	N/A	N/A	N/A	N/A	N/A
5500	Wi-Fi 802.11a/n/ac	Extremity	Back	No	0.249	N/A	N/A	N/A	N/A	N/A
5800	Wi-Fi 802.11a/n/ac	Extremity	Back	No	0.301	N/A	N/A	N/A	N/A	N/A
Antenna 2										
2400	Wi-Fi 802.11b/g/n	Extremity	Back	No	0.207	N/A	N/A	N/A	N/A	N/A
5200	Wi-Fi 802.11a/n/ac	Extremity	Back Fingerprint Scanner Extended	No	0.303	N/A	N/A	N/A	N/A	N/A
5300	Wi-Fi 802.11a/n/ac	Extremity	Back Fingerprint Scanner Extended	No	0.272	N/A	N/A	N/A	N/A	N/A
5500	Wi-Fi 802.11a/n/ac	Extremity	Back Fingerprint Scanner Extended	No	0.331	N/A	N/A	N/A	N/A	N/A
5800	Wi-Fi 802.11a/n/ac	Extremity	Back Fingerprint Scanner Extended	No	0.288	N/A	N/A	N/A	N/A	N/A

Note(s):

Repeated measurement is not required since the original highest measured SAR is <0.8 W/kg (1-g) or 2 W/kg (10-g) .

12. Simultaneous Transmission Conditions

12.1. Simultaneous transmission SAR test exclusion considerations

KDB 447498 D01 General RF Exposure Guidance provides two procedures for determining simultaneous transmission SAR test exclusion: Sum of SAR and SAR to Peak Location Ratio (SPLSR)

RF Exposure Condition	Item	Capable Transmit Configurations			
Body	1	DTS	+	DTS	
	2	DTS	+	U-NII	
	3	U-NII	+	U-NII	
	4	DSS	+	U-NII	
Extremity	5	DTS	+	DTS	+
	6	DTS	+	U-NII	+
	7	U-NII	+	U-NII	+
	8	DSS	+	U-NII	+

Sum of SAR

To qualify for simultaneous transmission SAR test exclusion based upon Sum of SAR the sum of the reported standalone SARs for all simultaneously transmitting antennas shall be below the applicable standalone SAR limit. If the sum of the SARs is above the applicable limit then simultaneous transmission SAR test exclusion may still apply if the requirements of the SAR to Peak Location Ratio (SPLSR) evaluation are met.

12.2. Estimated SAR for Simultaneous Transmission SAR Analysis

Considerations for SAR estimation

- When standalone SAR test exclusion applies, standalone SAR must also be estimated to determine simultaneous transmission SAR test exclusion.
- Dedicated Host Approach criteria for SAR test exclusion is likewise applied to SAR estimation, with certain distinctions between test exclusion and SAR estimation:
 - When the separation distance from the antenna to an adjacent edge is ≤ 5 mm, a distance of 5 mm is applied for SAR estimation; this is the same between test exclusion and SAR estimation calculations.
 - When the separation distance from the antenna to an adjacent edge is > 5 mm but ≤ 50 mm, the actual antenna-to-edge separation distance is applied for SAR estimation.
 - When the minimum test separation distance is > 50 mm, the estimated SAR value is 0.4 W/kg
- Please refer to Estimated SAR Tables to see which test positions are inherently compliant as they consist of only estimated SAR values for all applicable transmitters and consequently will always have sum of SAR values < 1.2 W/kg. Simultaneous transmission SAR analysis was therefore not performed for these test positions.

Estimated SAR for WLAN

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)					Estimated 1-g SAR Value (W/kg)				
		dBm	mW	Top	Right	Bottom	Left	Front	Top	Right	Bottom	Left	Front
Antenna 1													
Wi-Fi 2.4 GHz	2462	23.00	200	38.5	80.7	111.9	16.5	4	-MEASURE	-MEASURE	0.400	-MEASURE	-MEASURE
Wi-Fi 5.2 GHz	5240	20.50	112	38.5	80.7	111.9	16.5	4	-MEASURE	-MEASURE	0.400	-MEASURE	-MEASURE
Wi-Fi 5.3 GHz	5320	20.50	112	38.5	80.7	111.9	16.5	4	-MEASURE	-MEASURE	0.400	-MEASURE	-MEASURE
Wi-Fi 5.5 GHz	5700	20.50	112	38.5	80.7	111.9	16.5	4	-MEASURE	-MEASURE	0.400	-MEASURE	-MEASURE
Wi-Fi 5.8 GHz	5825	20.50	112	38.5	80.7	111.9	16.5	4	-MEASURE	-MEASURE	0.400	-MEASURE	-MEASURE
Bluetooth	2480	2.00	2	38.5	50	50	16.5	4	0.011	0.008	0.008	0.025	0.084
Antenna 2													
Wi-Fi 2.4 GHz	2462	23.00	200	38.5	16.5	111.9	80.7	4	-MEASURE	-MEASURE	0.400	-MEASURE	-MEASURE
Wi-Fi 5.2 GHz	5240	20.50	112	38.5	16.5	111.9	80.7	4	-MEASURE	-MEASURE	0.400	-MEASURE	-MEASURE
Wi-Fi 5.3 GHz	5320	20.50	112	38.5	16.5	111.9	80.7	4	-MEASURE	-MEASURE	0.400	-MEASURE	-MEASURE
Wi-Fi 5.5 GHz	5700	20.50	112	38.5	16.5	111.9	80.7	4	-MEASURE	-MEASURE	0.400	-MEASURE	-MEASURE
Wi-Fi 5.8 GHz	5825	19.50	89	38.5	16.5	111.9	80.7	4	-MEASURE	-MEASURE	0.400	-MEASURE	-MEASURE

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)	Estimated 10-g SAR Value (W/kg)
		dBm	mW	Back	Back
				Antenna 1	
Bluetooth	2480	2.00	2	24.5	0.007

12.3. Sum of the SAR

RF Exposure conditions	Test Position	Standalone SAR (W/kg)					Σ 1-g SAR (W/kg)			
		DTS		U-NII		DSS	①+②	①+④	③+④	④+⑤
		①	②	③	④	⑤				
		WLAN/BT Antenna 1	WLAN Antenna 2	WLAN/BT Antenna 1	WLAN Antenna 2	WLAN/BT Antenna 1				
Body	Front	0.149	0.504	0.349	0.626	0.084	0.653	0.775	0.975	0.710
	Edge Top	0.172	0.172	0.145	1.116	0.011	0.344	1.288	1.261	1.127
	Edge Top Tilt	0.192	0.373	0.340	0.504	0.011	0.565	0.696	0.844	0.515
	Edge Right	0.087	1.085	0.119	1.363	0.008	1.172	1.450	1.482	1.371
	Edge Left	0.407	0.050	1.066	0.055	0.025	0.457	0.462	1.121	0.080

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

RF Exposure conditions	Test Position	Standalone SAR (W/kg)						Σ 10-g SAR (W/kg)			
		DTS		U-NII		DSS	NFC	①+②+⑥	①+④+⑥	③+④+⑥	④+⑤+⑥
		①	②	③	④	⑤	⑥				
		WLAN/BT Antenna 1	WLAN Antenna 2	WLAN/BT Antenna 1	WLAN Antenna 2	WLAN/BT Antenna 1	WLAN/BT Antenna 1				
Extremity	Back	0.179	0.211	0.518	0.415	0.007	0.038	0.428	0.632	0.971	0.460

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 10-g SAR is < 4 W/kg or the SPLSR is < 0.1 for all circumstances that require SPLSR calculation.

Appendixes

Refer to separated files for the following appendixes.

Appendix A: SAR Setup Photos

Appendix B: SAR System Check Plots

Appendix C: SAR Highest Test Plots

Appendix D: SAR Tissue Ingredients

Appendix E: SAR Probe Certificates

Appendix F: SAR Dipole Certificates

END OF REPORT