SAR EVALUATION REPORT

FCC 47 CFR § 2.1093
IEEE Std 1528-2013
(Class II Permissive Change)

For

Wireless Module
(Tested inside of Panasonic Tablet PC FZ-M1)

Model: WL15B
FCC ID: ACJ9TGWL15B

Report Number: 11018650H-A-R1
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Prepared for

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NVLAP LAB CODE: 200572-0

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http://www.ul.com/japan/jpn/pages/services/emc/

Revision History

Rev.	Issue Date	Revisions	Revised By
--	12/09/2015	Initial Issue	T. Hatakeda
1	01/13/2016	Page 44 Section 14 WLAN Aux Edge 3 SAR value was Corrected.	T. Hatakeda

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1. Attestation of Test Results

Applicant	PANASONIC CORPORATION OF NORTH AMERICA
DUT description	Wireless Module (Tested inside of Panasonic Tablet PC FZ-M1)
Model	WL15B
Test device is	An identical prototype
Device category	Portable
Exposure category	General Population/Uncontrolled Exposure
Date tested	November 16 to 20, 2015

Applicable Standards	Test Results
FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013	Pass

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.This report is a revised version of 11018650H-A. 11018650H-A is replaced with this report.

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1.1. Summary of Highest 1-g SAR Results

Worst Case SAR data for each Frequency Band

RF Exposure Rule	Freq. Range	Highest Reported SAR	Limit
15.247	2400-2480 MHz	WLAN: 1.188 W/kg (Edge 3) Bluetooth: Exclusion	1.6 W/kg
15.407	5150-5250 MHz	Exclusion	
	5250-5350 MHz	Body: 0.602 W/kg (Edge 3)	
	5500-5700 MHz	Body: 0.969 W/kg (Edge 1)	
15.247	5725-5850 MHz	Body: 0.664 W/kg (Edge 1)	
Simultaneous Transmission Condition		0.634 W/kg (refer to Section 14) (The highest across exposure conditions)	

LEGEND:

- Bottom side = Rear of display(Tablet mode)
- Edge 1 = Top Edge(Tablet mode)
- Edge 2 = Left Edge(Tablet mode)
- Edge 3 = Bottom Edge(Tablet mode)
- Edge 4 = Right Edge(Tablet mode)

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2. Test Methodology

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:

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

3. Facilities and Accreditation

*Shielded room for SAR testings

The test sites and measurement facilities used to collect data are located at 4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN.

UL Japan, Inc. is accredited by NVLAP, Laboratory Code 200572-0

The full scope of accreditation can be viewed at

http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

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4. Calibration and Uncertainty

4.1. Measuring Instrument Calibration

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

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date ＊Interval(month)
MNA-03	Vector Reflectometer	Copper Mountain Technologies	PLANAR R140	0030913	SAR	2015/10/30＊12
MDPK-03	Dielectric assessment kit	Schmid&Partner Engineering AG	DAK-3.5	0008	SAR	2015/03/10＊12
MOS-37	Digital thermometer	LKM electronic	DTM3000	-	SAR	2015/07/07＊12
COTS-MSAR-04	Dielectric assessment software	Schmid&Partner Engineering AG	DAK		SAR	-

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System check

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date ＊Interval(month)
MPM-11	Dual Power Meter	Agilent	E4419B	MY45102060	SAR	2015/08/04＊12
MPSE-15	Power sensor	Agilent	E9301A	MY41498311	SAR	2015/08/04＊12
MPSE-16	Power sensor	Agilent	E9301A	MY41498313	SAR	2015/08/04＊12
MRFA-24	Pre Amplifier	R&K	R&K CGA020M602-2633R	B30550	SAR	2015/06/15＊12
MSG-10	Signal Generator	Agilent	N5181A	MY47421098	SAR	2015/11/16＊12
MAT-78	Attenuator	Telegrartner	J01156A0011	0042294119	SAR	Pre Check
MPM-15	Power Meter	Agilent	N1914A	MY53060017	SAR	2015/06/15＊12
MPSE-21	Power sensor	Agilent	N8482H	MY52460010	SAR	2015/06/15＊12
MHDC-12	Dual Directional Coupler	Hewlett Packard	772D	2839A0016	SAR(2-18GHz)	Pre Check
MDA-07	Dipole Antenna	Schmid&Partner Engineering AG	D2450V2	713	SAR(D2450)	2013/09/10＊36
MMSL2450	Tissue simulation liqud (Body)	Schmid&Partner Engineering AG	MSL2450V2	SL AA 245 BA	SAR*Daily Check Target Value ±5%	Pre Check
MDA-08	Dipole Antenna	Schmid&Partner Engineering AG	D5GHzV2	1020	SAR(D5G)	2015/01/13＊12
MMBBL3.5-5.8	Tissue simulation liqud (Body)	Schmid&Partner Engineering AG	MBBL3500-5800V5	SL AAM 501 DA	SAR*Daily Check Target Value ±5%	Pre Check
MDAE-02	Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE4	1369	SAR	2015/05/22＊12
MPB-08	Dosimetric E-Field Probe	Schmid&Partner Engineering AG	EX3DV4	3917	SAR	2015/05/29＊12
MPF-03	2mm Oval Flat Phantom	Schmid&Partner Engineering AG	QDOVA001BB	1203	SAR	2015/05/11＊12
MDH-04	Device holder	Schmid&Partner Engineering AG	Mounting device for transmitter	-	SAR	Pre Check
MOS-35	Digital thermometer	HANNA	Checktemp 4	-	SAR	2015/07/07＊12
COTS-MSAR-03	Dasy5	Schmid&Partner Engineering AG	DASY5	-	SAR	-
MRBT-03	SAR robot	Schmid&Partner Engineering AG	TX60 Lspeag	F13/5PP1D1/A/01	SAR	2015/06/23＊12
MDAE-03	Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE4	1372	SAR	2015/06/15＊12
MPB-09	Dosimetric E-Field Probe	Schmid&Partner Engineering AG	EX3DV4	3922	SAR	2015/06/17＊12
MPF-04	2mm Oval Flat Phantom	Schmid&Partner Engineering AG	QDOVA001BB	1207	SAR	2015/05/11＊12
MDH-03	Device holder	Schmid&Partner Engineering AG	Mounting device for transmitter	-	SAR	Pre Check
MRBT-04	SAR robot	Schmid&Partner Engineering AG	TX60 Lspeag	F13/5PP1A1/A/01	SAR	2015/06/23＊12

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Other

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date ＊Interval(month)
MPM-16	Power Meter	Agilent	8990B	MY51000271	Power	2015/04/01 ＊12
MPSE-22	Power sensor	Agilent	N1923A	MY54070003	Power	2015/04/01 ＊12
MPSE-23	Power sensor	Agilent	N1923A	MY54070004	Power	2015/04/01 ＊12
MAT-90	Attenuator	Weinschel Associates	WA56-10	56100306	Power	2015/06/01 ＊12
MAT-92	Attenuator	Weinschel Associates	WA56-10	56100308	Power	2015/06/01 ＊12

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

4.2. 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, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

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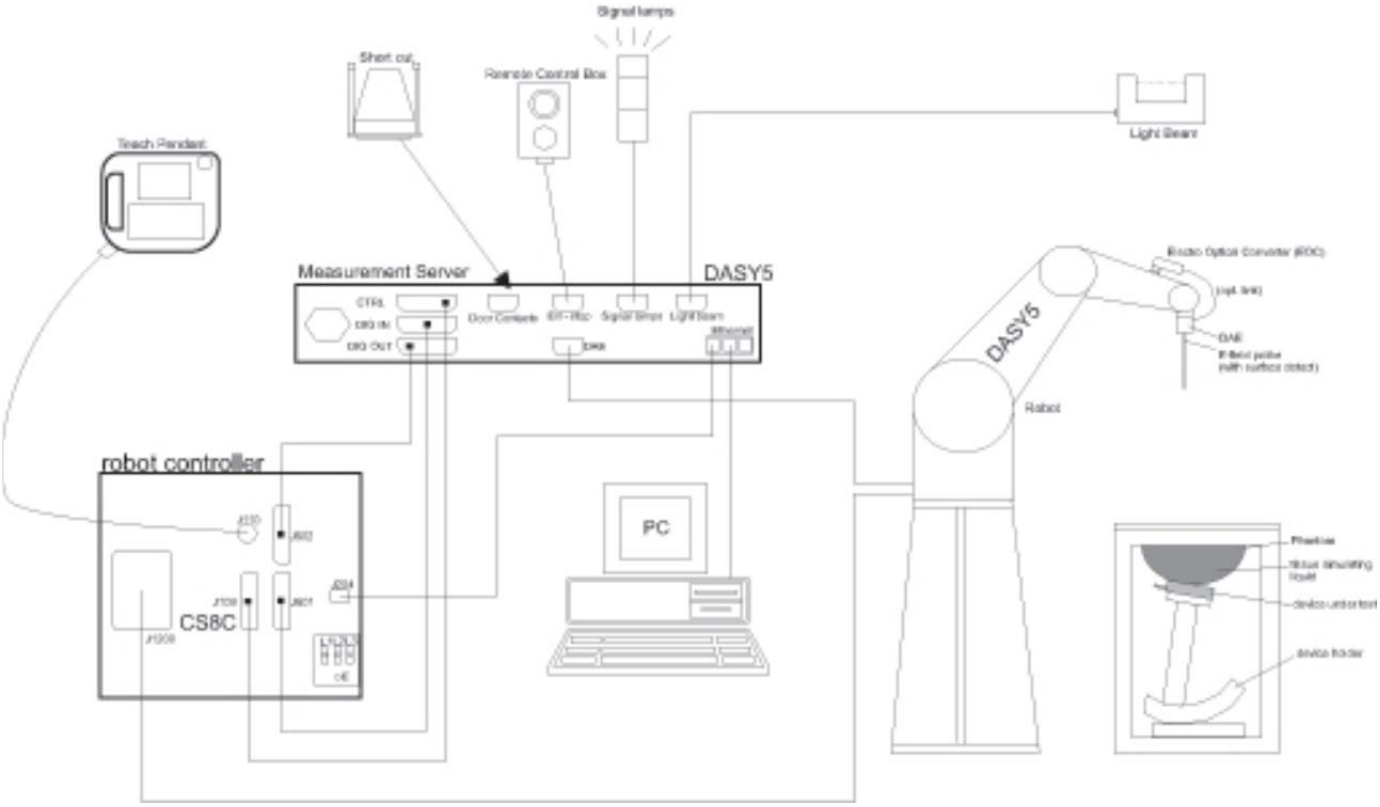
5. Measurement System Description and Setup

The DASY5 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 DASY5 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.

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6. SAR Measurement Procedure

6.1. Normal SAR Measurement Procedure

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 IEEE Standard 1528 and IEC 62209 standards, 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	½·δ·ln(2) ± 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.	

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

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 *reported* SAR from the area scan based *1-g SAR estimation* 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.

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6.2. Volume Scan Procedures

Step 1: Repeat Step 1-4 in Section 6.1

Step 2: Volume Scan

Volume Scans are used to assess peak SAR and averaged SAR measurements in largely extended 3-dimensional volumes within any phantom. This measurement does not need any previous area scan. The grid can be anchored to a user specific point or to the current probe location.

Step 3: 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.

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7. Device Under Test

Wireless Module (Tested inside of Panasonic Tablet PC FZ-M1) Model: WL15B	
Operating Configuration(s)	• Tablet modes
Exposure Condition(s)	• The device is used in close proximity to the body. Specific details of the required test positions are provided in Section 8 “Exposure Conditions”
Accessory	• None

7.1. Band and Air Interfaces

Tx Frequency Bands	• 802.11a/b/g/n/ac: 2412 - 2472 MHz, b / g / HT20 / HT40 5150 - 5250 MHz, a / HT20 / HT40 / HT80 5250 - 5350 MHz, a / HT20 / HT40 / HT80 5500 - 5700 MHz, a / HT20 / HT40 / HT80 5725 - 5850 MHz, a / HT20 / HT40 / HT80 • Bluetooth: 2402 - 2480 MHz
Modulation	• 802.11a/b/g/n/ac : BPSK, QPSK, CCK, 16-QAM and 64-QAM and 256-QAM • Bluetooth 4.0+LE: GFSK, DQPSK, 8-DPSK
Duty Cycle	• WLAN: 100% • Bluetooth 89%

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7.2. Testing Rationale

Test selection was performed in accordance with KDB248227 D01.

The standalone (SISO) SAR results were considered acceptable for the MIMO simultaneous transmission analysis as the MIMO power does not exceed the SISO power.

The antenna separation distance will not be less than 50mm.

Bluetooth transmits using the WLAN Aux Antenna. Bluetooth can transmit simultaneously with the WLAN Main Antenna. Bluetooth cannot transmit simultaneously with the WLAN Aux Antenna in WLAN MIMO mode.

Supported Simultaneous Scenarios

Band	WLAN		Bluetooth
	Main Ant	Aux Ant	Aux Ant
2.4 GHz	✓	✓	
	✓		✓
5 GHz	✓	✓	
	✓		✓

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8. Exposure Conditions

Refer to Section 17 “Antenna Dimensions and Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

8.1. Test Configurations for the Main Antenna, SISO and MIMO Modes

Tablet Mode

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Bottom side	11.2 mm	Yes	
Front	-	No	SAR is not required as this is not a typical use scenario.
Edge 1	4.1 mm	Yes	
Edge 2	161.9 mm	No	Refer to section 12.1 for SAR exclusion justification.
Edge 3	121.8 mm	No	Refer to section 12.1 for SAR exclusion justification.
Edge 4	17.6 mm	Yes	.

8.2. Test Configurations for the Auxiliary Antenna, SISO and MIMO Modes

Tablet Mode

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Bottom side	12.3 mm	Yes	
Front	-	No	SAR is not required as this is not a typical use scenario.
Edge 1	122.6 mm	No	Refer to section 12.1 for SAR exclusion justification.
Edge 2	162.2 mm	No	Refer to section 12.1 for SAR exclusion justification.
Edge 3	3.3 mm	Yes	
Edge 4	17.3 mm	Yes	

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8.3. Test Configurations for the Auxiliary Antenna, Bluetooth

Tablet Mode

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Bottom side	12.3 mm	No	Refer to section 12.1 for SAR exclusion justification.
Front	-	No	SAR is not required as this is not a typical use scenario.
Edge 1	122.6 mm	No	Refer to section 12.1 for SAR exclusion justification.
Edge 2	162.2 mm	No	Refer to section 12.1 for SAR exclusion justification.
Edge 3	3.3 mm	No	Refer to section 12.1 for SAR exclusion justification.
Edge 4	17.3 mm	No	Refer to section 12.1 for SAR exclusion justification.

LEGEND:

- Bottom side = Rear of display(Tablet mode)
- Edge 1 = Top Edge(Tablet mode)
- Edge 2 = Left Edge(Tablet mode)
- Edge 3 = Bottom Edge(Tablet mode)
- Edge 4 = Right Edge(Tablet mode)

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9. Summary of Required Test Modes

The initial test configuration for 2.4 GHz and 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures. When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.

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

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9.1. Wi-Fi 2.4GHz (DTS Band)

SISO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)		Tune-up upper Power (dBm)		SAR Test (Yes/No)	Note(s)
					Main Ant Tx	Sub Ant Tx	Main Ant Tx	Sub Ant Tx		
2.4	802.11b	1 Mbps	1	2412	14.93	14.92	15.0	15.0	Yes	3
			6	2437	14.96	14.93				
			11	2462	15.00	14.91				
			12	2467	14.95	14.90				
			13	2472	Not Required	Not Required	12.0	12.0		
	802.11g	6 Mbps	1	2412	Not Required	Not Required	15.0	15.0	No	1
			6	2437	Not Required	Not Required				
			11	2462	Not Required	Not Required				
			12	2467	Not Required	Not Required	13.5	13.5		
			13	2472	Not Required	Not Required	2.0	2.0		
	802.11n (HT20)	6.5 Mbps	1	2412	Not Required	Not Required	15.0	15.0	No	1
			6	2437	Not Required	Not Required				
			11	2462	Not Required	Not Required				
			12	2467	Not Required	Not Required	13.5	13.5		
			13	2472	Not Required	Not Required	2.0	2.0		
	802.11n (HT40)	13.5 Mbps	3	2422	14.92	14.91	15.0	15.0	No	1
			6	2437	14.91	14.92				
			9	2452	14.91	14.91				
			10	2457	Not Required	Not Required	12.5	12.5		
			11	2462	Not Required	Not Required	1.0	1.0		

MIMO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)	Tune-up upper Power (dBm)	SAR Test (Yes/No)	Note(s)
					Main&Sub Ant Simultaneous Tx	Main&Sub Ant Simultaneous Tx		
2.4	802.11n (HT20)	6.5 Mbps	1	2412	Not Required	15.0	No	2
			6	2437	Not Required			
			11	2462	Not Required			
			12	2467	Not Required	11.0		
			13	2472	Not Required	-0.5		
	802.11n (HT40)	13.5 Mbps	1	2412	Not Required	15.0	No	2
			6	2437	Not Required			
			9	2452	Not Required			
			10	2457	Not Required	11.0		
			11	2462	Not Required	-2.5		

Note(s):

1. According to KDB248227D01, SAR is not required for 802.11g/n HT20/HT40 channels 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.
2. The standalone (SISO) SAR results were considered acceptable for the MIMO simultaneous transmission analysis as the MIMO power does not exceed the SISO power. The antenna separation distance will not be less than 50mm.
3. SAR test channel was chosen according to KDB248227D01. (shaded blue frame)

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9.2. Wi-Fi 5GHz (U-NII-1 and U-NII-2A Bands)

SISO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)		Tune-up upper Power (dBm)		SAR Test (Yes/No)	Note(s)
					Main Ant Tx	Sub Ant Tx	Main Ant Tx	Sub Ant Tx		
5.2 (U-NII-1)	802.11a	6 Mbps	36	5180	Not Required	Not Required	13.5	13.5	No	3
			40	5200	Not Required	Not Required				
			44	5220	Not Required	Not Required				
			48	5240	Not Required	Not Required				
	802.11n (HT20)	6.5 Mbps	36	5180	Not Required	Not Required	13.5	13.5	No	3
			40	5200	Not Required	Not Required				
			44	5220	Not Required	Not Required				
			48	5240	Not Required	Not Required				
	802.11n (HT40)	13.5 Mbps	38	5190	Not Required	Not Required	13.5	13.5	No	3
			46	5230	Not Required	Not Required				
	802.11ac (VHT20)	6.5 Mbps	36	5180	Not Required	Not Required	13.5	13.5	No	3
			40	5200	Not Required	Not Required				
			44	5220	Not Required	Not Required				
			48	5240	Not Required	Not Required				
	802.11ac (VHT40)	13.5 Mbps	38	5190	Not Required	Not Required	13.5	13.5	No	3
			46	5230	Not Required	Not Required				
	802.11ac (VHT80)	29.3 Mbps	42	5210	13.46	13.50	13.5	13.5	No	3
5.3 (U-NII-2A)	802.11a	6 Mbps	52	5260	Not Required	Not Required	13.5	13.5	No	1,2
			56	5280	Not Required	Not Required				
			60	5300	Not Required	Not Required				
			64	5320	Not Required	Not Required				
	802.11n (HT20)	6.5 Mbps	52	5260	Not Required	Not Required	13.5	13.5	No	1,2
			56	5280	Not Required	Not Required				
			60	5300	Not Required	Not Required				
			64	5320	Not Required	Not Required				
	802.11n (HT40)	13.5 Mbps	54	5270	Not Required	Not Required	13.5	13.5	No	1,2
			62	5310	Not Required	Not Required				
	802.11ac (VHT20)	6.5 Mbps	52	5260	Not Required	Not Required	13.5	13.5	No	1,2
			56	5280	Not Required	Not Required				
			60	5300	Not Required	Not Required				
			64	5320	Not Required	Not Required				
	802.11ac (VHT40)	13.5 Mbps	54	5270	Not Required	Not Required	13.5	13.5	No	1,2
			62	5310	Not Required	Not Required				
	802.11ac (VHT80)	29.3 Mbps	58	5290	13.38	13.41	13.5	13.5	Yes	5

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MIMO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)	Tune-up upper Power (dBm)	SAR Test (Yes/No)	Note(s)
					Main&Sub Ant Simultaneous Tx	Main&Sub Ant Simultaneous Tx		
5.2 (U-NII-1)	802.11n (HT20)	6.5 Mbps	36	5180	Not Required	13.5	No	4
			40	5200	Not Required			
			44	5220	Not Required			
			48	5240	Not Required			
	802.11n (HT40)	13.5 Mbps	38	5190	Not Required	13.5	No	4
			46	5230	Not Required			
	802.11ac (VHT20)	6.5 Mbps	36	5180	Not Required	13.5	No	4
			40	5200	Not Required			
			44	5220	Not Required			
			48	5240	Not Required			
	802.11ac (VHT40)	13.5 Mbps	38	5190	Not Required	13.5	No	4
			46	5230	Not Required			
	802.11ac (VHT80)	29.3 Mbps	42	5210	Not Required	13.5	No	4
5.3 (U-NII-2A)	802.11n (HT20)	6.5 Mbps	52	5260	Not Required	13.5	No	4
			56	5280	Not Required			
			60	5300	Not Required			
			64	5320	Not Required			
	802.11n (HT40)	13.5 Mbps	54	5270	Not Required	13.5	No	4
			62	5310	Not Required			
	802.11ac (VHT20)	6.5 Mbps	52	5260	Not Required	13.5	No	4
			56	5280	Not Required			
			60	5300	Not Required			
			64	5320	Not Required			
	802.11ac (VHT40)	13.5 Mbps	54	5270	Not Required	13.5	No	4
			62	5310	Not Required			
	802.11ac (VHT80)	29.3 Mbps	58	5290	Not Required	13.5	No	4

Note(s):

1. Output Power and SAR measurement is not required for 802.11a/n/ac VHT20/VHT40 channels when the specified tune-up tolerances for 802.11a/n/ac VHT20/VHT40 are lower than 802.11ac VHT80 by more than ½ dB and the measured SAR is ≤ 1.2 W/Kg.
2. 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 with the largest bandwidth and lowest data rate is selected (i.e. 802.11ac VHT80).
3. 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.
4. The standalone (SISO) SAR results were considered acceptable for the MIMO simultaneous transmission analysis as the MIMO power does not exceed the SISO power. The antenna separation distance will not be less than 50mm.
5. SAR test channel was chosen according to KDB248227D01. (shaded blue frame)

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9.3. Wi-Fi 5GHz (U-NII-2C Band)

SISO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)		Tune-up upper Power (dBm)		SAR Test (Yes/No)	Note(s)
					Main Ant Tx	Sub Ant Tx	Main Ant Tx	Sub Ant Tx		
5.5 (U-NII-2C)	802.11a	6 Mbps	100	5500	Not Required	Not Required	13.5	13.5	No	1,2
			104	5520	Not Required	Not Required				
			108	5540	Not Required	Not Required				
			112	5560	Not Required	Not Required				
			116	5580	Not Required	Not Required				
			120	5600	Not Required	Not Required				
			124	5620	Not Required	Not Required				
			128	5640	Not Required	Not Required				
			132	5660	Not Required	Not Required				
			136	5680	Not Required	Not Required				
			140	5700	Not Required	Not Required				
	802.11n (HT20)	6.5 Mbps	100	5500	Not Required	Not Required	13.5	13.5	No	1,2
			104	5520	Not Required	Not Required				
			108	5540	Not Required	Not Required				
			112	5560	Not Required	Not Required				
			116	5580	Not Required	Not Required				
			120	5600	Not Required	Not Required				
			124	5620	Not Required	Not Required				
			128	5640	Not Required	Not Required				
			132	5660	Not Required	Not Required				
			136	5680	Not Required	Not Required				
			140	5700	Not Required	Not Required				
	802.11n (HT40)	13.5 Mbps	102	5510	Not Required	Not Required	13.5	13.5	No	1,2
			110	5550	Not Required	Not Required				
			118	5590	Not Required	Not Required				
			126	5630	Not Required	Not Required				
			134	5670	Not Required	Not Required				
	802.11ac (VHT20)	6.5 Mbps	100	5500	Not Required	Not Required	13.5	13.5	No	1,2
			104	5520	Not Required	Not Required				
			108	5540	Not Required	Not Required				
			112	5560	Not Required	Not Required				
			116	5580	Not Required	Not Required				
			120	5600	Not Required	Not Required				
			124	5620	Not Required	Not Required				
			128	5640	Not Required	Not Required				
			132	5660	Not Required	Not Required				
			136	5680	Not Required	Not Required				
			140	5700	Not Required	Not Required				
			144	5720	Not Required	Not Required				
	802.11ac (VHT40)	13.5 Mbps	102	5510	Not Required	Not Required	13.5	13.5	Mo	1,2
			110	5550	Not Required	Not Required				
			118	5590	Not Required	Not Required				
			126	5630	Not Required	Not Required				
			134	5670	Not Required	Not Required				
			142	5710	Not Required	Not Required				
	802.11ac (VHT80)	29.3 Mbps	106	5530	13.47	13.48	13.5	13.5	Yes	4
			122	5610	13.42	13.44				
			138	5690	13.41	13.46				

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MIMO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)	Tune-up upper Power (dBm)	SAR Test (Yes/No)	Note(s)
					Main&Sub Ant Simultaneous Tx	Main&Sub Ant Simultaneous Tx		
5.5 (U-NII-2C)	802.11n (HT20)	6.5 Mbps	100	5500	Not Required	13.5	No	3
			104	5520	Not Required			
			108	5540	Not Required			
			112	5560	Not Required			
			116	5580	Not Required			
			120	5600	Not Required			
			124	5620	Not Required			
			128	5640	Not Required			
			132	5660	Not Required			
			136	5680	Not Required			
			140	5700	Not Required			
	802.11n (HT40)	13.5 Mbps	102	5510	Not Required	13.5	No	3
			110	5550	Not Required			
			118	5590	Not Required			
			126	5630	Not Required			
			134	5670	Not Required			
	802.11ac (VHT20)	6.5 Mbps	100	5500	Not Required	13.5	No	3
			104	5520	Not Required			
			108	5540	Not Required			
			112	5560	Not Required			
			116	5580	Not Required			
			120	5600	Not Required			
			124	5620	Not Required			
			128	5640	Not Required			
			132	5660	Not Required			
			136	5680	Not Required			
			140	5700	Not Required			
			144	5720	Not Required			
	802.11ac (VHT40)	13.5 Mbps	102	5510	Not Required	13.5	Mo	3
			110	5550	Not Required			
			118	5590	Not Required			
			126	5630	Not Required			
			134	5670	Not Required			
			142	5710	Not Required			
	802.11ac (VHT80)	29.3 Mbps	106	5530	Not Required	13.5	No	3
			122	5610	Not Required			
			138	5690	Not Required			

Note(s):

1. Output Power and SAR measurement is not required for 802.11a/n/ac VHT20/VHT40 channels when the specified tune-up tolerances for 802.11a/n/ac VHT20/VHT40 are lower than 802.11ac VHT80 by more than ½ dB and the measured SAR is ≤ 1.2 W/Kg.
2. 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 with the largest bandwidth and lowest data rate is selected (i.e. 802.11ac VHT80).
3. The standalone (SISO) SAR results were considered acceptable for the MIMO simultaneous transmission analysis as the MIMO power does not exceed the SISO power. The antenna separation distance will not be less than 50mm.
4. SAR test channel was chosen according to KDB248227D01. (shaded blue frame)

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9.4. Wi-Fi 5GHz (U-NII-3 Band)

SISO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)		Tune-up upper Power (dBm)		SAR Test (Yes/No)	Note(s)
					Main Ant Tx	Sub Ant Tx	Main Ant Tx	Sub Ant Tx		
5.8 (U-NII-3)	802.11a	6 Mbps	149	5745	Not Required	Not Required	13.5	13.5	No	1,2
			153	5765	Not Required	Not Required				
			157	5785	Not Required	Not Required				
			161	5805	Not Required	Not Required				
			165	5825	Not Required	Not Required				
	802.11n (HT20)	6.5 Mbps	149	5745	Not Required	Not Required	13.5	13.5	No	1,2
			153	5765	Not Required	Not Required				
			157	5785	Not Required	Not Required				
			161	5805	Not Required	Not Required				
			165	5825	Not Required	Not Required				
	802.11n (HT40)	13.5 Mbps	151	5755	Not Required	Not Required	13.5	13.5	No	1,2
			159	5795	Not Required	Not Required				
	802.11ac (VHT20)	6.5 Mbps	149	5745	Not Required	Not Required	13.5	13.5	No	1,2
			153	5765	Not Required	Not Required				
			157	5785	Not Required	Not Required				
			161	5805	Not Required	Not Required				
			165	5825	Not Required	Not Required				
	802.11ac (VHT40)	13.5 Mbps	151	5755	Not Required	Not Required	13.5	13.5	No	1,2
			159	5795	Not Required	Not Required				
	802.11ac (VHT80)	29.3 Mbps	155	5775	13.48	13.48	13.5	13.5	Yes	4

MIMO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)	Tune-up upper Power (dBm)	SAR Test (Yes/No)	Note(s)
					Main&Sub Ant Simultaneous Tx	Main&Sub Ant Simultaneous Tx		
5.8 (U-NII-3)	**802.11n (HT20)**	6.5 Mbps	149	5745	Not Required	13.5	No	3
			153	5765	Not Required	13.5		
			157	5785	Not Required	13.5		
			161	5805	Not Required	13.5		
			165	5825	Not Required	13.5		
	802.11n (HT40)	13.5 Mbps	151	5755	Not Required	13.5	No	3
			159	5795	Not Required	13.5		
	802.11ac (VHT20)	6.5 Mbps	149	5745	Not Required	13.5	No	3
			153	5765	Not Required	13.5		
			157	5785	Not Required	13.5		
			161	5805	Not Required	13.5		
			165	5825	Not Required	13.5		
	802.11ac (VHT40)	13.5 Mbps	151	5755	Not Required	13.5	No	3
			159	5795	Not Required	13.5		
	802.11ac (VHT80)	29.3 Mbps	155	5775	Not Required	13.5	No	3

Note(s):

1. Output Power and SAR measurement is not required for 802.11a/n/ac VHT20/VHT40 channels when the specified tune-up tolerances for 802.11a/n/ac VHT20/VHT40 are lower than 802.11ac VHT80 by more than ½ dB and the measured SAR is ≤ 1.2 W/Kg.
2. 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 with the largest bandwidth and lowest data rate is selected (i.e. 802.11ac VHT80).
3. The standalone (SISO) SAR results were considered acceptable for the MIMO simultaneous transmission analysis as the MIMO power does not exceed the SISO power. The antenna separation distance will not be less than 50mm.
4. SAR test channel was chosen according to KDB248227D01. (shaded blue frame)

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9.5. Correlation of Output Power

Correlation of Output Power between latest test report and this SAR tests

It was checked that measured average power of the antenna port was correlated with Tune-up upper power. Tune-up upper power in this report is equivalent to latest original test report(FCC ID PD98260D2/ IC Number 1000M-8260D2 RF Exposure Lab, LLC Report No: SAR. 20150611). That is, EMC power is the maximum power including the tune-up tolerance range. Measured average Power used for SAR testing can be regarded to be correlated with the Tune-up upper power is within -2dB.

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Maximum measured average Power of Original test report (dBm)		Measured average Power in this SAR test (dBm)		Tune-up upper Power (dBm)		Note(s)
					Main Ant Tx	Aux Ant Tx	Main Ant Tx	Aux Ant Tx	Main Ant Tx	Sub Ant Tx	
2.4	802.11b	1 Mbps	6	2437	15.00	-	14.96	-	15.0	15.0	
	802.11g	6 Mbps	11	2462	14.92	-	14.88	-			
	802.11n (HT20)	HT4	11	2462	-	14.88	-	14.86			
	802.11n (HT40)	HT4	3	2422	-	14.84	-	14.84			

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Maximum measured average Power of Original test report (dBm)		Measured average Power in this SAR test (dBm)		Tune-up upper Power (dBm)		Note(s)
					Main Ant Tx	Aux Ant Tx	Main Ant Tx	Aux Ant Tx	Main Ant Tx	Sub Ant Tx	
5.2 (U-NII-1)	802.11a	6Mbps	44	5220	13.50	-	13.45	-	13.50	13.50	
	802.11n (HT20)	HT4	36	5180	13.40	-	13.43	-			
	802.11n (HT40)	HT4	38	5190	13.34	-	13.34	-			
	802.11ac (VHT80)	VHT6	42	5210	-	13.32	-	13.24			

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Maximum measured average Power of Original test report (dBm)		Measured average Power in this SAR test (dBm)		Tune-up upper Power (dBm)		Note(s)
					Main Ant Tx	Aux Ant Tx	Main Ant Tx	Aux Ant Tx	Main Ant Tx	Sub Ant Tx	
5.3 (U-NII-2A)	802.11a	6Mbps	60	5300	13.50	-	13.44	-	13.50	13.50	
	802.11n (HT20)	HT4	56	5280	13.43	-	13.48	-			
	802.11n (HT40)	HT4	54	5270	-	13.33	-	13.44			
	802.11ac (VHT80)	VHT6	58	5290	13.33	-	13.04	-			

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Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Maximum measured average Power of Original test report (dBm)		Measured average Power in this SAR test (dBm)		Tune-up upper Power (dBm)		Note(s)
					Main Ant Tx	Aux Ant Tx	Main Ant Tx	Aux Ant Tx	Main Ant Tx	Sub Ant Tx	
5.5 (U-NII-2C)	802.11a	6Mbps	116	5580	13.50	-	13.43	-	13.50	13.50	
	802.11n (HT20)	HT4	140	5700	-	13.44	-	13.39			
	802.11n (HT40)	HT4	110	5550	-	13.39	-	13.43			
	802.11ac (VHT80)	VHT6	106	5530	-	13.34	-	13.41			

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Maximum measured average Power of Original test report (dBm)		Measured average Power in this SAR test (dBm)		Tune-up upper Power (dBm)		Note(s)
					Main Ant Tx	Aux Ant Tx	Main Ant Tx	Aux Ant Tx	Main Ant Tx	Sub Ant Tx	
5.8 (U-NII-3)	802.11a	6Mbps	157	5785	13.50	-	13.47	-	13.50	13.50	
	802.11n (HT20)	HT8	149	5745	13.39	-	13.49	-			
	802.11n (HT40)	HT8	159	5795	-	13.34	-	13.39			
	802.11ac (VHT80)	VHT6	155	5775	-	13.31	-	13.23			

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10. Dielectric Property Measurements

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.

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

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

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Dielectric Property Measurements Results:

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.

Date	Freq. (MHz)	Liquid Parameters	Measured	Target	Delta (%)	Limit ±(%)
2015/11/17	Body 2450	Relative Permittivity (ε_r):	50.57	52.70	-4.04	5
		Conductivity (σ):	1.94	1.95	-0.56	5
	Body 2410	Relative Permittivity (ε_r):	50.71	52.76	-3.89	5
		Conductivity (σ):	1.86	1.91	-2.34	5
	Body 2475	Relative Permittivity (ε_r):	50.48	52.67	-4.16	5
		Conductivity (σ):	1.98	1.99	-0.50	5
2015/11/16	Body 5180	Relative Permittivity (ε_r):	47.50	49.05	-3.15	10
		Conductivity (σ):	5.33	5.27	1.07	5
	Body 5250	Relative Permittivity (ε_r):	47.18	48.95	-3.62	10
		Conductivity (σ):	5.46	5.35	1.91	5
	Body 5600	Relative Permittivity (ε_r):	46.95	48.48	-3.16	10
		Conductivity (σ):	5.84	5.76	1.41	5
	Body 5750	Relative Permittivity (ε_r):	46.70	48.27	-3.26	10
		Conductivity (σ):	6.16	5.94	3.81	5
	Body 5825	Relative Permittivity (ε_r):	46.68	48.20	-3.15	10
		Conductivity (σ):	6.19	6.00	3.23	5

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11. System Performance 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 remeasured 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 ± 0.5 cm for SAR measurements.
- 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 1GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 12 mm (1GHz to 3GHz) and15 mm (below 1GHz) 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 2 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 1.4 mm
- The dipole input power (forward power) was 100 mW(For 5GHz band) or 250 mW(For 2.4GHz band).
- The results are normalized to 1 W input power.

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Reference Target SAR Values

The target(reference) SAR values can be obtained from the calibration certificate of system validation dipoles(Section 15.9 to Section 15.10). The target SAR values are SAR measured value in the calibration certificate scaled to 1W.

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (mW/g)		
				1g/10g	Head	Body
D2450V2	713	9/3/2013	2450	1g	52.0	50.4
				10g	24.2	23.6
D5GHV2	1020	1/13/2015	5250	1g	80.4	73.8
				10g	22.9	20.7
			5600	1g	81.4	77.2
				10g	23.1	21.4
			5750	1g	78.8	73.7
				10g	22.4	20.4

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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 10% of the manufacturer calibrated dipole SAR target.

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %
	Type	Serial #			Zoom Scan	Normalize to 1 W		
11/17/2015	D2450V2	713	Body	1g	13.50	54.0	50.4	7.14
				10g	6.32	25.3	23.6	7.12
11/16/2015	D5GHzV2 5.25 GHz	1020	Body	1g	7.97	79.7	73.8	7.99
				10g	2.24	22.4	20.7	8.21
11/16/2015	D5GHzV2 5.6 GHz	1020	Body	1g	8.39	83.9	77.2	8.68
				10g	2.33	23.3	21.4	8.88
11/16/2015	D5GHzV2 5.75 GHz	1020	Body	1g	8.02	80.2	73.7	8.82
				10g	2.24	22.4	20.4	9.80

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12. RF Exposure Conditions (Test Configurations)

Refer to Section 17 “Antenna Dimensions and Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

12.1. Standalone SAR Test Exclusion Considerations

Standalone SAR test exclusion was based upon the following criteria:

1. According to KDB 447498D01 § 4.1 f) if the antenna is at close proximity to user then the outer surface of the DUT should be treated as the radiating surface. The test separation distance is then determined by the smallest distance between the outer surface of the device and the user. For the purposes of this report close proximity has been defined as closer than 50 mm. For antennas <50 mm from the bottom side or edge the separation distance used for the SAR exclusion calculations is 5 mm.
2. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
3. If the antenna to DUT adjacent bottom side or edge separation distance is >50mm, the actual antenna to user separation distance is used to determine SAR exclusion and estimated SAR value.
4. Output power is the maximum rated power (including tune-up or manufacturing tolerances) and includes source-based averaging.
5. According to KDB248227D01, SAR is not required for 802.11g/n HT20/HT40 channels 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.

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12.1.1. SAR exclusion calculations for Wi-Fi SISO (1 Tx) and Bluetooth for antenna <50mm from the user

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Bottom side	Edge 1	Edge 2	Edge 3	Edge 4	Front	Bottom side	Edge 1	Edge 2	Edge 3	Edge 4	Front
WiFi - Main Antenna																
WLAN Main	WiFi	2462	15.00	32	11.20	4.10	161.90	121.80	17.60		10 -MEASURE-	10 -MEASURE-	> 50 mm	> 50 mm	10 -MEASURE-	
WLAN Main	WiFi	5240	13.50	22	11.20	4.10	161.90	121.80	17.60		10.1 -MEASURE-	10.1 -MEASURE-	> 50 mm	> 50 mm	10.1 -MEASURE-	
WLAN Main	WiFi	5320	13.50	22	11.20	4.10	161.90	121.80	17.60		10.1 -MEASURE-	10.1 -MEASURE-	> 50 mm	> 50 mm	10.1 -MEASURE-	
WLAN Main	WiFi	5700	13.50	22	11.20	4.10	161.90	121.80	17.60		10.5 -MEASURE-	10.5 -MEASURE-	> 50 mm	> 50 mm	10.5 -MEASURE-	
WLAN Main	WiFi	5825	13.50	22	11.20	4.10	161.90	121.80	17.60		10.6 -MEASURE-	10.6 -MEASURE-	> 50 mm	> 50 mm	10.6 -MEASURE-	
Bluetooth / WiFi - Aux Antenna																
WLAN Aux	WiFi	2462	15.00	32	12.30	122.60	162.20	3.30	17.30		10 -MEASURE-	> 50 mm	> 50 mm	10 -MEASURE-	10 -MEASURE-	
WLAN Aux	WiFi	5240	13.50	22	12.30	122.60	162.20	3.30	17.30		10.1 -MEASURE-	> 50 mm	> 50 mm	10.1 -MEASURE-	10.1 -MEASURE-	
WLAN Aux	WiFi	5320	13.50	22	12.30	122.60	162.20	3.30	17.30		10.1 -MEASURE-	> 50 mm	> 50 mm	10.1 -MEASURE-	10.1 -MEASURE-	
WLAN Aux	WiFi	5700	13.50	22	12.30	122.60	162.20	3.30	17.30		10.5 -MEASURE-	> 50 mm	> 50 mm	10.5 -MEASURE-	10.5 -MEASURE-	
WLAN Aux	WiFi	5825	13.50	22	12.30	122.60	162.20	3.30	17.30		10.6 -MEASURE-	> 50 mm	> 50 mm	10.6 -MEASURE-	10.6 -MEASURE-	
WLAN Aux	Bluetooth	2480	5.10	3	12.30	122.60	162.20	3.30	17.30		0.9 -EXEMPT-	> 50 mm	> 50 mm	0.9 -EXEMPT-	0.9 -EXEMPT-	

Note(s):

1. According to KDB 447498D01, if the calculated threshold value is >3 then SAR testing is required.
2. SAR exclusion was not assessed for 2 Tx (MIMO) as the higher 1 Tx (SISO) SAR values were used for simultaneous transmission analysis.
3. The separation distances from antennas to the bottom side or the edge were input. For antennas <50 mm from the bottom side or edge(shaded blue frame in above table) the separation distance used for the SAR exclusion calculations is 5 mm.

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12.1.2. SAR exclusion calculations for Wi-Fi SISO (1 Tx) and Bluetooth for antenna >50mm from the user

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Bottom side	Edge 1	Edge 2	Edge 3	Edge 4	Front	Bottom side	Edge 1	Edge 2	Edge 3	Edge 4	Front
WiFi - Main Antenna																
WLAN Main	WiFi	2462	15.00	32	11.20	4.10	161.90	121.80	17.60		< 50 mm	< 50 mm	1214.6 mW -EXEMPT-	813.6 mW -EXEMPT-	< 50 mm	
WLAN Main	WiFi	5240	13.50	22	11.20	4.10	161.90	121.80	17.60		< 50 mm	< 50 mm	1184.5 mW -EXEMPT-	783.5 mW -EXEMPT-	< 50 mm	
WLAN Main	WiFi	5320	13.50	22	11.20	4.10	161.90	121.80	17.60		< 50 mm	< 50 mm	1184 mW -EXEMPT-	783 mW -EXEMPT-	< 50 mm	
WLAN Main	WiFi	5700	13.50	22	11.20	4.10	161.90	121.80	17.60		< 50 mm	< 50 mm	1181.8 mW -EXEMPT-	780.8 mW -EXEMPT-	< 50 mm	
WLAN Main	WiFi	5825	13.50	22	11.20	4.10	161.90	121.80	17.60		< 50 mm	< 50 mm	1181.2 mW -EXEMPT-	780.2 mW -EXEMPT-	< 50 mm	
Bluetooth / WiFi - Aux Antenna																
WLAN Aux	WiFi	2462	15.00	32	12.30	122.60	162.20	3.30	17.30		< 50 mm	821.6 mW -EXEMPT-	1217.6 mW -EXEMPT-	< 50 mm	< 50 mm	
WLAN Aux	WiFi	5240	13.50	22	12.30	122.60	162.20	3.30	17.30		< 50 mm	791.5 mW -EXEMPT-	1187.5 mW -EXEMPT-	< 50 mm	< 50 mm	
WLAN Aux	WiFi	5320	13.50	22	12.30	122.60	162.20	3.30	17.30		< 50 mm	791 mW -EXEMPT-	1187 mW -EXEMPT-	< 50 mm	< 50 mm	
WLAN Aux	WiFi	5700	13.50	22	12.30	122.60	162.20	3.30	17.30		< 50 mm	788.8 mW -EXEMPT-	1184.8 mW -EXEMPT-	< 50 mm	< 50 mm	
WLAN Aux	WiFi	5825	13.50	22	12.30	122.60	162.20	3.30	17.30		< 50 mm	788.2 mW -EXEMPT-	1184.2 mW -EXEMPT-	< 50 mm	< 50 mm	
WLAN Aux	Bluetooth	2480	5.10	3	12.30	122.60	162.20	3.30	17.30		< 50 mm	821.3 mW -EXEMPT-	1217.3 mW -EXEMPT-	< 50 mm	< 50 mm	

Note(s):

1. According to KDB 447498D01, if the calculated Power threshold is less than the output power then SAR testing is required.
2. SAR exclusion was not assessed for 2 Tx (MIMO) as the higher 1 Tx (SISO) SAR values were used for simultaneous transmission analysis.
3. The separation distances from antennas to the bottom side or the edge were input. For antennas <50 mm from the bottom side or edge(shaded blue frame in above table) the separation distance used for the SAR exclusion calculations is 5 mm.

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12.2. Estimated SAR for Simultaneous Transmission SAR Analysis

Considerations for using estimated SAR values:

1. According to KDB 447498D01 § 4.1 f) if the antenna is at close proximity to user then the outer surface of the DUT should be treated as the radiating surface. The test separation distance is then determined by the smallest distance between the outer surface of the device and the user. For the purposes of this report close proximity has been defined as closer than 50 mm. For antennas <50 mm from the bottom side or edge the separation distance used for the estimated SAR calculations is 5 mm.
2. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
3. Output power is the maximum rated power (including tune-up or manufacturing tolerances) and includes source-based averaging.
4. If the antenna separation distance is > 50mm then the estimated SAR value is 0.4 W/Kg.
5. Formulas round separation distance to nearest mm and power to nearest mW before calculating estimated SAR

12.2.1. Estimated SAR for Wi-Fi 1 Tx (SISO) and Bluetooth

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
			dBm	mW	Bottom side	Edge 1	Edge 2	Edge 3	Edge 4	Front	Bottom side	Edge 1	Edge 2	Edge 3	Edge 4	Front
WiFi - Main Antenna																
WLAN Main	WiFi	2462	15.00	32	11.20	4.10	161.90	121.80	17.60		-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	
WLAN Main	WiFi	5240	13.50	22	11.20	4.10	161.90	121.80	17.60		-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	
WLAN Main	WiFi	5320	13.50	22	11.20	4.10	161.90	121.80	17.60		-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	
WLAN Main	WiFi	5700	13.50	22	11.20	4.10	161.90	121.80	17.60		-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	
WLAN Main	WiFi	5825	13.50	22	11.20	4.10	161.90	121.80	17.60		-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	
Bluetooth / WiFi - Aux Antenna																
WLAN Aux	WiFi	2462	15.00	32	12.30	122.60	162.20	3.30	17.30		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
WLAN Aux	WiFi	5240	13.50	22	12.30	122.60	162.20	3.30	17.30		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
WLAN Aux	WiFi	5320	13.50	22	12.30	122.60	162.20	3.30	17.30		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
WLAN Aux	WiFi	5700	13.50	22	12.30	122.60	162.20	3.30	17.30		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
WLAN Aux	WiFi	5825	13.50	22	12.30	122.60	162.20	3.30	17.30		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
WLAN Aux	Bluetooth	2480	5.10	3	12.30	122.60	162.20	3.30	17.30		0.126	0.400	0.400	0.126	0.126	

Notes:

1. Estimated SAR for 2 Tx (MIMO) was not assessed as the higher 1 Tx (SISO) SAR values were used for simultaneous transmission analysis.
2. As Simultaneous Transmission SAR of the DUT was compliant under the higher power conditions of Wi-Fi 1 Tx, it was judged that such analyses would be unnecessary for Wi-Fi 2 Tx (MIMO), given the substantially lower MIMO power levels and considerable separation distance between WLAN Main and the WLAN Auxiliary antennas.
3. Wherever appropriate, Wi-Fi 1 Tx (SISO) SAR values were used to represent those of Wi-Fi 2 Tx (MIMO); if compliance can be shown with the more conservative Wi-Fi 1 Tx values, then there is no need to perform separate assessment for Wi-Fi 2 Tx.
4. The separation distances from antennas to the bottom side or the edge were input. For antennas <50 mm from the bottom side or edge(shaded blue frame in above table) the separation distance used for the SAR exclusion calculations is 5 mm.

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13. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

KDB 248227 D01 SAR meas for 802.11 v02:

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,

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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*.

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13.1. Wi-Fi 2.4 GHz Band

Main Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 1	802.11b	0	1	2412	15.00	14.93	0.838	0.852	1	
			6	2437	15.00	14.96	0.876	0.883	2	
			11	2462	15.00	15.00	0.958	0.959	3	
Edge 4	802.11b	0	1	2412	15.00	14.93				
			6	2437	15.00	14.96				
			11	2462	15.00	15.00	0.135	0.135	4	
Bottom side	802.11b	0	1	2412	15.00	14.93				
			6	2437	15.00	14.96				
			11	2462	15.00	15.00	0.317	0.317	5	

Auxiliary Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 3	802.11b	0	1	2412	15.00	14.92	1.130	1.151	6	
			6	2437	15.00	14.93	1.170	1.188	7	
			11	2462	15.00	14.91	1.030	1.052	8	
Edge 4	802.11b	0	1	2412	15.00	14.92				
			6	2437	15.00	14.93	0.120	0.122	9	
			11	2462	15.00	14.91				
Bottom side	802.11b	0	1	2412	15.00	14.92				
			6	2437	15.00	14.93	0.312	0.317	10	
			11	2462	15.00	14.91				

Note(s):

1. Highest *reported* SAR is ≤ 0.4 W/kg. Therefore, further SAR measurements within this exposure condition are not required.
2. Highest *reported* SAR is > 0.4 W/kg. Due to the highest *reported* SAR for this test position, other test positions in standalone exposure condition were evaluated until a SAR ≤ 0.8 W/kg was *reported*.
3. 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.

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13.2. Wi-Fi 5.3 GHz Band

Main Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 1	802.11ac80	0	58	5290	13.50	13.38	0.555	0.571	1	
Edge 4	802.11ac80	0	58	5290	13.50	13.38	0.040	0.041	2	
Bottom side	802.11ac80	0	58	5290	13.50	13.38	0.177	0.182	3	

Auxiliary Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 3	802.11ac80	0	58	5290	13.50	13.41	0.590	0.602	4	
Edge 4	802.11ac80	0	58	5290	13.50	13.41	0.047	0.048	5	
Bottom side	802.11ac80	0	58	5290	13.50	13.41	0.115	0.117	6	

Note(s):

1. Highest *reported* SAR is ≤ 0.4 W/kg. Therefore, further SAR measurements within this exposure condition are not required.
2. Highest *reported* SAR is > 0.4 W/kg. Due to the highest *reported* SAR for this test position, other test positions in standalone exposure condition were evaluated until a SAR ≤ 0.8 W/kg was *reported*.
3. 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.

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13.3. Wi-Fi 5.5 GHz Band

Main Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 1	802.11ac80	0	106	5530	13.50	13.47	0.963	0.969	1	
			122	5610	13.50	13.42	0.658	0.670	2	
			138	5690	13.50	13.41	0.656	0.669	3	
Edge 4	802.11ac80	0	106	5530	13.50	13.47	0.024	0.024	4	
			122	5610	13.50	13.42				
			138	5690	13.50	13.41				
Bottom side	802.11ac80	0	106	5530	13.50	13.47	0.171	0.172	5	
			122	5610	13.50	13.42				
			138	5690	13.50	13.41				

Auxiliary Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 3	802.11ac80	0	106	5530	13.50	13.48	0.862	0.865	6	
			122	5610	13.50	13.44	0.789	0.799	7	
			138	5690	13.50	13.46	0.672	0.678	8	
Edge 4	802.11ac80	0	106	5530	13.50	13.48	0.086	0.086	9	
			122	5610	13.50	13.44				
			138	5690	13.50	13.46				
Bottom side	802.11ac80	0	106	5530	13.50	13.48	0.266	0.267	10	
			122	5610	13.50	13.44				
			138	5690	13.50	13.46				

Note(s):

1. Highest *reported* SAR is ≤ 0.4 W/kg. Therefore, further SAR measurements within this exposure condition are not required.
2. Highest *reported* SAR is > 0.4 W/kg. Due to the highest *reported* SAR for this test position, other test positions in standalone exposure condition were evaluated until a SAR ≤ 0.8 W/kg was *reported*.
3. 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.

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13.4. Wi-Fi 5.8 GHz Band

Main Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 1	802.11ac80	0	155	5775	13.50	13.48	0.661	0.664	1	
Edge 4	802.11ac80	0	155	5775	13.50	13.48	0.00591	0.00594	2	
Bottom side	802.11ac80	0	155	5775	13.50	13.48	0.071	0.071	3	

Auxiliary Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 3	802.11ac80	0	155	5775	13.50	13.48	0.545	0.548	4	
Edge 4	802.11ac80	0	155	5775	13.50	13.48	0.019	0.019	5	
Bottom side	802.11ac80	0	155	5775	13.50	13.48	0.251	0.252	6	

Note(s):

1. Highest *reported* SAR is ≤ 0.4 W/kg. Therefore, further SAR measurements within this exposure condition are not required.
2. Highest *reported* SAR is > 0.4 W/kg. Due to the highest *reported* SAR for this test position, other test positions in standalone exposure condition were evaluated until a SAR ≤ 0.8 W/kg was *reported*.
3. 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.

13.5. Summary of Highest SAR Values

Technology/ Band	Test configuration			Mode	Dist. (mm)	Freq. (Mhz)	Power (dBm)	1g SAR (W/kg)
	Transmit Antenna	Exposure	Position					
Wi-Fi 2.4 GHz	Auxiliary	Body	Edge 3	802.11b	0	2437	14.93	1.188
Wi-Fi 5.3 GHz	Auxiliary	Body	Edge 3	802.11ac80	0	5290	13.41	0.602
Wi-Fi 5.6 GHz	Main	Body	Edge 1	802.11ac80	0	5530	13.47	0.969
Wi-Fi 5.8 GHz	Main	Body	Edge 1	802.11ac80	0	5775	13.48	0.664

Results for the highest scaled SAR values in each frequency band and mode

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13.6. SAR Measurement Variability and Uncertainty

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01. 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.

Repeated measurement was not performed since the original highest measured SAR is < 0.80 W/kg

Wireless Technologies	Test Configuration			Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Plot No.
	Transmit Antenna	Exposure	Position					Original	Repeated		
Wi-Fi 2.4 GHz	Auxiliary	Body	Edge 3	802.11b	0	6	2437	1.170	1.140	1.026	1
Wi-Fi 5.3 GHz	Auxiliary	Body	Edge 3	802.11ac80 VHT0	0	58	5290	0.590	N/A	N/A	-
Wi-Fi 5.6 GHz	Main	Body	Edge 1	802.11ac80 VHT0	0	106	5530	0.963	0.891	1.081	2
Wi-Fi 5.8 GHz	Main	Body	Edge 1	802.11ac80 VHT0	0	155	5775	0.661	N/A	N/A	-

Note(s):

Repeated Measurement is not required since the original highest measured SAR for all band is < 0.80 W/kg.

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14. Simultaneous Transmission SAR Analysis

Test Position	WiFi 2.4 GHz Main	WiFi 2.4 GHz Aux	Bluetooth	∑ 1-g SAR (mW/g)
Edge 1, Wi-Fi 1 Tx	0.959		0.400	1.359
Edge 1 , Wi-Fi 2 Tx	0.959	0.400		1.359
Edge 3, Wi-Fi 1 Tx	0.400		0.126	0.526
Edge 3, Wi-Fi 2 Tx	0.400	1.188		1.588
Edge 4, Wi-Fi 1 Tx	0.135		0.126	0.261
Edge 4, Wi-Fi 2 Tx	0.135	0.122		0.257
Bottom side, Wi-Fi 1 Tx	0.317		0.126	0.443
Bottom side, Wi-Fi 2 Tx	0.317	0.317		0.634

Note(s):

1. Bluetooth and Wi-Fi Aux cannot simultaneously transmit.
2. Values shaded green are estimated SAR.
3. Edge 2 with WLAN Main antenna and Edge 2 with WLAN Aux/Bluetooth antenna weren't required stand-alone SAR test. Therefore the Simultaneous Transmission SAR Analysis wasn't considered.

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Test Position	WiFi 5.3 GHz Main	WiFi 5.3 GHz Aux	Bluetooth	∑ 1-g SAR (mW/g)
Edge 1, Wi-Fi 1 Tx	0.571		0.400	0.971
Edge 1 , Wi-Fi 2 Tx	0.571	0.400		0.971
Edge 3, Wi-Fi 1 Tx	0.400		0.126	0.526
Edge 3, Wi-Fi 2 Tx	0.400	0.602		1.002
Edge 4, Wi-Fi 1 Tx	0.041		0.126	0.167
Edge 4, Wi-Fi 2 Tx	0.041	0.048		0.089
Bottom side, Wi-Fi 1 Tx	0.182		0.126	0.308
Bottom side, Wi-Fi 2 Tx	0.182	0.117		0.299

Note(s):

1. Bluetooth and Wi-Fi Aux cannot simultaneously transmit.
2. Values shaded green are estimated SAR.
3. Edge 2 with WLAN Main antenna and Edge 2 with WLAN Aux/Bluetooth antenna weren't required stand-alone SAR test. Therefore the Simultaneous Transmission SAR Analysis wasn't considered.

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Test Position	WiFi 5.5 GHz Main	WiFi 5.5 GHz Aux	Bluetooth	∑ 1-g SAR (mW/g)
Edge 1, Wi-Fi 1 Tx	0.969		0.400	1.369
Edge 1 , Wi-Fi 2 Tx	0.969	0.400		1.369
Edge 3, Wi-Fi 1 Tx	0.400		0.126	0.526
Edge 3, Wi-Fi 2 Tx	0.400	0.865		1.265
Edge 4, Wi-Fi 1 Tx	0.024		0.126	0.150
Edge 4, Wi-Fi 2 Tx	0.024	0.086		0.110
Bottom side, Wi-Fi 1 Tx	0.172		0.126	0.298
Bottom side, Wi-Fi 2 Tx	0.172	0.267		0.439

Note(s):

1. Bluetooth and Wi-Fi Aux cannot simultaneously transmit.
2. Values shaded green are estimated SAR.
3. Edge 2 with WLAN Main antenna and Edge 2 with WLAN Aux/Bluetooth antenna weren't required stand-alone SAR test. Therefore the Simultaneous Transmission SAR Analysis wasn't considered.

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Test Position	WiFi 5.8 GHz Main	WiFi 5.8 GHz Aux	Bluetooth	∑ 1-g SAR (mW/g)
Edge 1, Wi-Fi 1 Tx	0.664		0.400	1.064
Edge 1 , Wi-Fi 2 Tx	0.664	0.400		1.064
Edge 3, Wi-Fi 1 Tx	0.400		0.126	0.526
Edge 3, Wi-Fi 2 Tx	0.400	0.548		0.948
Edge 4, Wi-Fi 1 Tx	0.006		0.126	0.132
Edge 4, Wi-Fi 2 Tx	0.006	0.019		0.025
Bottom side, Wi-Fi 1 Tx	0.071		0.126	0.197
Bottom side, Wi-Fi 2 Tx	0.071	0.252		0.323

Note(s):

1. Bluetooth and Wi-Fi Aux cannot simultaneously transmit.
2. Values shaded green are estimated SAR.
3. Edge 2 with WLAN Main antenna and Edge 2 with WLAN Aux/Bluetooth antenna weren't required stand-alone SAR test. Therefore the Simultaneous Transmission SAR Analysis wasn't considered.

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15. Appendixes

Refer to separated files for the following appendixes.

15.1. System Performance Check Plots

15.2. SAR Test Plots for Wi-Fi 2.4 GHz Band

15.3. SAR Test Plots for Wi-Fi 5.3 GHz Bands

15.4. SAR Test Plots for Wi-Fi 5.5 GHz Bands

15.5. SAR Test Plots for Wi-Fi 5.8 GHz Bands

15.6. SAR Test Plots for Repeat Measurement

15.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3917

15.8. Calibration Certificate for E-Field Probe EX3DV4 - SN 3922

15.9. Calibration Certificate for D2450V2 - SN 713

15.10. Calibration Certificate for D5GHzV2 - SN 1020

15.11. SAR Tissue Ingredients

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