FCC 47 CFR Parts 1 & 2
Published RF Exposure KDB Procedures
IEEE Std 1528-2013

SAR EVALUATION REPORT

For
Tablet Device

Model: A1599
FCC ID: BCGA1599

Report Number: 14U17895-S1
Issue Date: 8/13/2014

Prepared for
APPLE INC.
1 INFINITE LOOP, MS 26A
CUPERTINO, CA 95014-2084

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NVLAP LAB CODE 200065-0

REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
--	8/13/2014	Initial Issue	--

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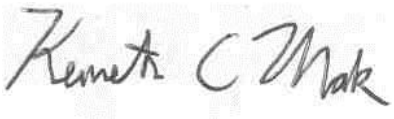
1. Attestation of Test Results

Applicant Name	APPLE INC.			
FCC ID	BCGA1599			
DUT Description	Tablet Device			
Exposure Category	General Population/Uncontrolled Exposure (1g SAR limit: 1.6 W/kg)			
The highest reported SAR	RF Exposure Conditions	Equipment Class		
		Licensed	DTS	UNII
	Stand-alone	N/A W/kg	1.180 W/kg	1.167 W/kg
	Simultaneous Transmission	N/A W/kg	N/A W/kg	1.491 W/kg
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013			
Test Results	Pass			
Date tested	7/23/2014 – 8/4/2014			

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released By:	Prepared By:
	
Bobby Bayani Senior Engineer UL Verification Services Inc.	Kenneth Mak Laboratory Engineer UL Verification Services Inc.

2. Test Methodology

The tests documented in this report were performed in accordance with FCC 47 CFR Parts 1 & 2, IEEE STD 1528-2013, the following FCC Published RF exposure KDB procedures, and TCB workshop updates:

- 447498 D01 General RF Exposure Guidance v05r02
- 616217 D04 SAR for Laptop and Tablets v01r01
- 248227 D01 SAR Meas for 802 11abg v01r02
- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- 865664 D02 SAR Reporting v01r01
- 690783 D01 SAR Listings on Grants v01r02

3. Facilities and Accreditation

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

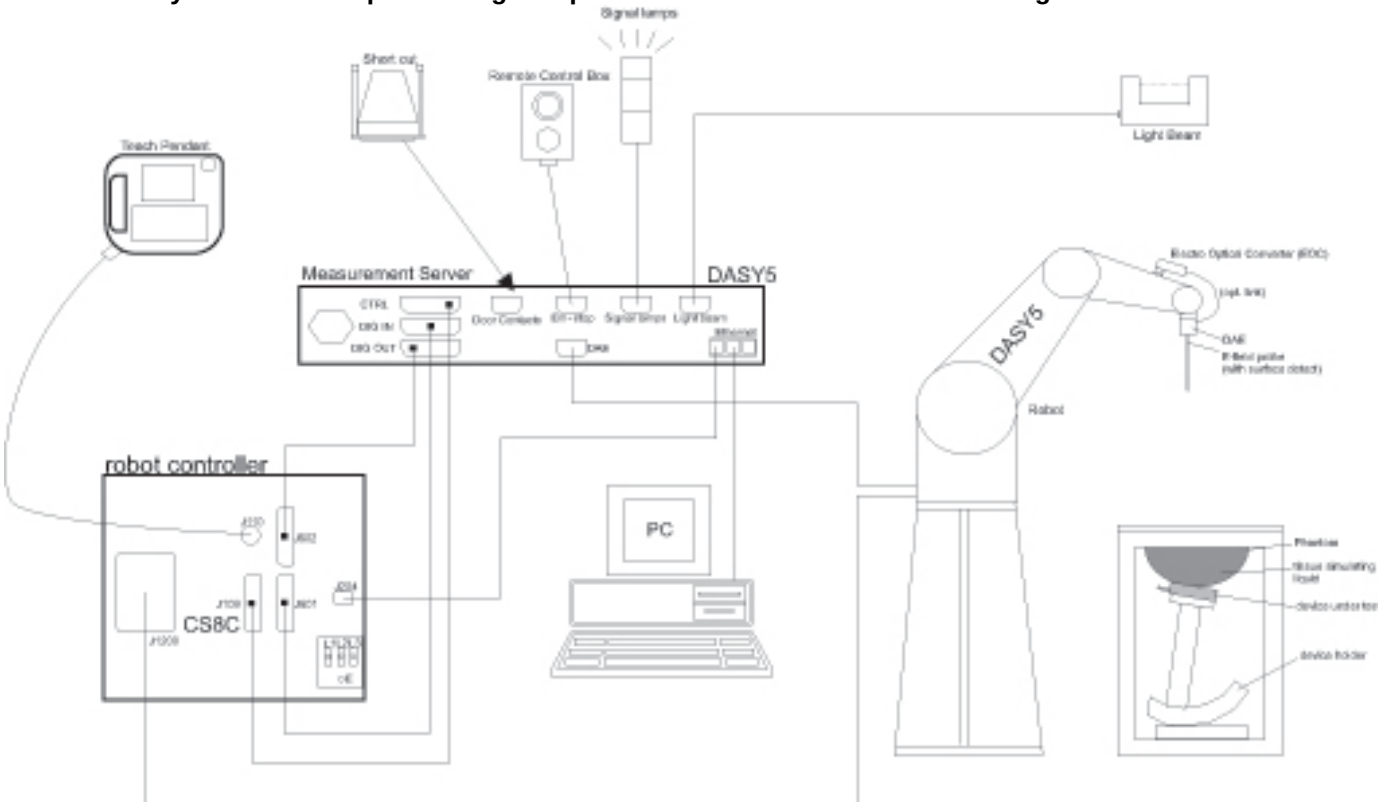
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	
SAR Lab F	
SAR Lab G	
SAR Lab H	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

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.

4.2.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	Agilent	E8363C	1391298J	12/3/2014
Dielectronic Probe kit	SPEAG	DAK-3.5	1082	9/10/2014
Dielectronic Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	Control Company	4242	122529162	9/19/2014

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Synthesized Signal Generator	HP	8665B	3744A01084	5/20/2015
Power Meter	Agilent	N1912A	MY50001018	8/23/2014
Power Sensor	Agilent	E9323A	MY53070005	5/1/2015
Power Sensor	Agilent	E9323A	US40411556	8/9/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795093	N/A
Directional coupler	Werlatone	C8060-102	2149	N/A
DC Power Supply	AMETEK	XT 20-3	1318A00530	N/A
Synthesized Signal Generator	HP	8665B	3744A01155	3/12/2015
Power Meter	Agilent	N1912A	MY52310061	12/12/2014
Power Sensor	Agilent	N1921A	MY52270022	12/12/2014
Power Sensor	Agilent	N1921A	MY52260009	12/12/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795092	N/A
Directional coupler	Werlatone	C8060-102	2141	N/A
DC Power Supply	BK PRECISION	1611	215-02292	N/A
E-Field Probe	SPEAG	EX3DV4	3885	9/18/2014
E-Field Probe	SPEAG	EX3DV4	3749	1/29/2015
E-Field Probe	SPEAG	EX3DV4	3901	2/25/2015
E-Field Probe	SPEAG	EX3DV4	3989	4/15/2015
Data Acquisition Electronics	SPEAG	DAE4	1357	2/17/2015
Data Acquisition Electronics	SPEAG	DAE4	1433	4/14/2015
Data Acquisition Electronics	SPEAG	DAE4	1239	4/15/2015
Data Acquisition Electronics	SPEAG	DAE3	500	5/15/2015
System Validation Dipole	SPEAG	D2450V2	706	5/20/2015
System Validation Dipole	SPEAG	D5GHzV2	1003	2/26/2015
System Validation Dipole	SPEAG	D5GHzV2	1168	12/12/2014

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	R & S	NRP2	103076-TJ	9/3/2015
Power Sensor	R & S	NRP-Z11	112141-BE	4/26/2015
Power Meter	R & S	NRP2	102820-FG	4/24/2015
Power Sensor	R & S	NRP-Z11	112140-JZ	4/26/2015

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

6. Device Under Test (DUT) Information

6.1. DUT Description

Model A1599 is a tablet with multimedia functions (music, application support, and video), IEEE 802.11a/b/g/n, MIMO 2x2, Bluetooth radio

There are two vendors of the Wi-Fi/Bluetooth radio modules to support the production volumes of the device. The two variants are referenced in this report as:

Variant 1 = Wi-Fi/BT module vendor 1

Variant 2 = Wi-Fi/BT module vendor 2

The Wi-Fi/Bluetooth radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances.

Complete SAR evaluation is performed on the device with one Wi-Fi/Bluetooth radio module and then, the test is repeated on the device with the other Wi-Fi/Bluetooth module at the highest peak SAR value.

Device dimension	Overall (Length x Width): 200.14mm x 134.7mm Overall Diagonal: 235mm Display Diagonal: 200mm
AirPlay	AirPlay mode enabled devices transfer data directly between each other ☒ AirPlay (WiFi 2.4 GHz) ☒ AirPlay (WiFi 5 GHz)
RF Exposure Condition(s)	Body Exposure with all surfaces and edges

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)	100%
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40)	100%
Bluetooth	2.4 GHz	Version 4.0 LE	77.52% (DH5)

6.3. Maximum Output Power

Band (GHz)	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Maximum Output Power (dBm)	
					WiFi 1	WiFi 2
2.4	802.11b	1 Tx	1	2412	16.5	
			6	2437	16.5	
			11	2462	16.5	
			12	2467	15.5	
			13	2472	14.5	
			1	2412		16.5
			6	2437		16.5
			11	2462		16.5
			12	2467		15.5
			13	2472		14.5
	802.11g	1 Tx	1	2412	16.0	
			2	2417	16.5	
			6	2437	16.5	
			10	2457	16.5	
			11	2462	15.5	
			12	2467	11.5	
			13	2472	4.0	
			1	2412		16.0
			2	2417		16.5
			6	2437		16.5
			10	2457		16.5
			11	2462		15.5
			12	2467		11.5
			13	2472		4.0
		2 Tx CDD	1	2412	14.5	14.5
			2	2417	16.5	16.5
			6	2437	16.5	16.5
			10	2457	16.5	16.5
			11	2462	14.5	14.5
			12	2467	9.5	9.5
			13	2472	2.0	2.0

Band (GHz)	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Maximum Output Power (dBm)	
					WiFi 1	WiFi 2
2.4	802.11n	1 Tx HT20	1	2412	16.0	
			2	2417	16.5	
			6	2437	16.5	
			10	2457	16.5	
			11	2462	15.5	
			12	2467	11.5	
			13	2472	4.0	
			1	2412		16.0
			2	2417		16.5
			6	2437		16.5
			10	2457		16.5
			11	2462		15.5
			12	2467		11.5
			13	2472		4.0
		2 Tx HT20 CDD	1	2412	14.5	14.5
			2	2417	16.5	16.5
			6	2437	16.5	16.5
			10	2457	16.5	16.5
			11	2462	14.5	14.5
			12	2467	9.5	9.5
			13	2472	2.0	2.0
		2 Tx HT20 STBC	1	2412	14.5	14.5
			2	2417	16.5	16.5
			6	2437	16.5	16.5
			10	2457	16.5	16.5
			11	2462	14.5	14.5
			12	2467	9.5	9.5
			13	2472	2.0	2.0
		2 Tx HT20 SDM	1	2412	14.5	14.5
			2	2417	16.5	16.5
			6	2437	16.5	16.5
			10	2457	16.5	16.5
			11	2462	14.5	14.5
			12	2467	9.5	9.5
			13	2472	2.0	2.0

Band (GHz)	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Maximum Output Power (dBm)	
					WiFi 1	WiFi 2
5.2	802.11a	1 Tx	36	5180	16.0	
			40	5200	16.0	
			44	5220	16.0	
			48	5240	16.0	
			36	5180		16.0
			40	5200		16.0
			44	5220		16.0
			48	5240		16.0
		2 Tx CDD	36	5180	16.0	16.0
			40	5200	16.0	16.0
			44	5220	16.0	16.0
			48	5240	16.0	16.0
	802.11n	1 Tx HT20	36	5180	16.0	
			40	5200	16.0	
			48	5240	16.0	
			36	5180		16.0
			40	5200		16.0
			48	5240		16.0
		1 Tx HT40	38	5180	13.5	
			46	5230	16.0	
			38	5180		13.5
			46	5230		16.0
		2 Tx HT20 CDD	36	5180	16.0	16.0
			40	5200	16.0	16.0
			48	5240	16.0	16.0
		2 Tx HT20 STBC	36	5180	16.0	16.0
			40	5200	16.0	16.0
			48	5240	16.0	16.0
		2 Tx HT20 SDM	36	5180	16.0	16.0
			40	5200	16.0	16.0
			48	5240	16.0	16.0
		2 Tx HT40 CDD	38	5190	11.5	11.5
			46	5230	16.0	16.0
		2 Tx HT40 STBC	38	5190	11.5	11.5
			46	5230	16.0	16.0
		2 Tx HT40 SDM	38	5190	11.5	11.5
			46	5230	16.0	16.0

Band (GHz)	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Maximum Output Power (dBm)	
					WiFi 1	WiFi 2
5.3	802.11a	1 Tx	52	5260	16.0	
			56	5280	16.0	
			60	5300	16.0	
			64	5320	15.0	
			52	5260		16.0
			56	5280		16.0
			60	5300		16.0
			64	5320		15.0
		2 Tx CDD	52	5260	16.0	16.0
			56	5280	16.0	16.0
			60	5300	16.0	16.0
			64	5320	14.0	14.0
	802.11n	1 Tx HT20	52	5260	16.0	
			60	5300	16.0	
			64	5320	15.0	
			52	5260		16.0
			60	5300		16.0
			64	5320		15.0
		1 Tx HT40	54	5270	16.0	
			62	5310	13.5	
			54	5270		16.0
			62	5310		13.5
		2 Tx HT20 CDD	52	5260	16.0	16.0
			56	5280	16.0	16.0
			60	5300	16.0	16.0
			64	5320	14.0	14.0
		2 Tx HT20 STBC	52	5260	16.0	16.0
			56	5280	16.0	16.0
			60	5300	16.0	16.0
			64	5320	14.0	14.0
		2 Tx HT20 SDM	52	5260	16.0	16.0
			56	5280	16.0	16.0
			60	5300	16.0	16.0
			64	5320	14.0	14.0
		2 Tx HT40 CDD	54	5270	16.0	16.0
			62	5310	11.5	11.5
		2 Tx HT40 STBC	54	5270	16.0	16.0
			62	5310	11.5	11.5
		2 Tx HT40 SDM	54	5270	16.0	16.0
			62	5310	11.5	11.5

Band (GHz)	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Maximum Output Power (dBm)	
					WiFi 1	WiFi 2
5.5	802.11a	1 Tx	100	5500	14.0	
			104	5520	15.5	
			108	5540	15.5	
			112	5560	15.5	
			116	5580	15.5	
			120	5600	15.5	
			124	5620	15.5	
			128	5640	15.5	
			132	5660	15.5	
			136	5680	15.5	
			140	5700	14.0	
			100	5500		14.0
			104	5520		15.5
			108	5540		15.5
			112	5560		15.5
			116	5580		15.5
			120	5600		15.5
			124	5620		15.5
			128	5640		15.5
			132	5660		15.5
			136	5680		15.5
			140	5700		14.0
		2 Tx CDD	100	5500	13.5	13.5
			104	5520	15.5	15.5
			108	5540	15.5	15.5
			112	5560	15.5	15.5
			116	5580	15.5	15.5
			120	5600	15.5	15.5
			124	5620	15.5	15.5
			128	5640	15.5	15.5
			132	5660	15.5	15.5
			136	5680	15.5	15.5
			140	5700	13.0	13.0

Band (GHz)	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Maximum Output Power (dBm)	
					WiFi 1	WiFi 2
5.5	802.11n	1 Tx HT20	100	5500	14.0	
			104	5520	15.5	
			120	5600	15.5	
			136	5680	15.5	
			140	5700	14.0	
			100	5500		14.0
			104	5520		15.5
			120	5600		15.5
			136	5680		15.5
			140	5700		14.0
		1 Tx HT40	102	5510	14.0	
			110	5550	15.5	
			134	5670	15.5	
			102	5510		14.0
			110	5550		15.5
			134	5670		15.5
		2 Tx HT20 CDD	100	5500	13.5	13.5
			104	5520	15.5	15.5
			120	5600	15.5	15.5
			136	5680	15.5	15.5
			140	5700	13.0	13.0
		2 Tx HT20 STBC	100	5500	13.5	13.5
			104	5520	15.5	15.5
			120	5600	15.5	15.5
			136	5680	15.5	15.5
			140	5700	13.0	13.0
		2 Tx HT20 SDM	100	5500	13.5	13.5
			104	5520	15.5	15.5
			120	5600	15.5	15.5
			136	5680	15.5	15.5
			140	5700	13.0	13.0
		2 Tx HT40 CDD	102	5510	12.0	12.0
			110	5550	15.5	15.5
			134	5670	15.0	15.0
		2 Tx HT40 STBC	102	5510	12.0	12.0
			110	5550	15.5	15.5
			134	5670	15.0	15.0
		2 Tx HT40 SDM	102	5510	12.0	12.0
			110	5550	15.5	15.5
			134	5670	15.0	15.0

Band (GHz)	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Maximum Output Power (dBm)	
					WiFi 1	WiFi 2
5.8	802.11a	1 Tx	149	5745	15.0	
			153	5765	15.5	
			157	5785	15.5	
			161	5805	15.5	
			165	5825	15.5	
			149	5745		15.0
			153	5765		15.5
			157	5785		15.5
			161	5805		15.5
			165	5825		15.5
		2 Tx CDD	149	5745	13.0	13.0
			153	5765	15.5	15.5
			157	5785	15.5	15.5
			161	5805	15.5	15.5
			165	5825	15.5	15.5
	802.11n	1 Tx HT20	149	5745	15.0	
			157	5785	15.5	
			165	5825	15.5	
			149	5745		15.0
			157	5785		15.5
			165	5825		15.5
		1 Tx HT40	151	5755	11.5	
			159	5795	15.5	
			151	5755		11.5
			159	5795		15.5
		2 Tx HT20 CDD	149	5745	13.0	13.0
			157	5785	15.5	15.5
			165	5825	15.5	15.5
		2 Tx HT20 STBC	149	5745	13.0	13.0
			157	5785	15.5	15.5
			165	5825	15.5	15.5
		2 Tx HT20 SDM	149	5745	13.0	13.0
			157	5785	15.5	15.5
			165	5825	15.5	15.5
		2 Tx HT40 CDD	151	5755	9.0	9.0
			159	5795	15.5	15.5
		2 Tx HT40 STBC	151	5755	9.0	9.0
			159	5795	15.5	15.5
		2 Tx HT40 SDM	151	5755	9.0	9.0
			159	5795	15.5	15.5

6.4. Simultaneous Transmission Condition

RF Exposure Condition	Capable Transmit Configurations
Body	SISO (1TX) 1. 5GHz (WiFi1) + BT (WiFi1) 2. 5GHz (WiFi2) + BT (WiFi1) MIMO (2TX) 3. 5GHz (WiFi1+WiFi2) + BT (WiFi1)
Notes: 1. Wi-Fi 2.4 GHz Radio cannot transmit simultaneously with Bluetooth Radio.	

7. RF Exposure Conditions (Test Configurations)

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

The EUT implements the power reduction scheme for SAR compliance, for specific device configuration and orientations, as described below. The complete description of the implementation and functionality is provided in the “Operational Description of Power Reduction” exhibit.

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.

7.1.1. SAR Test Exclusion Calculations for Wi-Fi SISO (1 Tx) Transmit Conditions

Antennas < 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
WiFi 1 / Bluetooth																
WiFi 1	Wi-Fi 2.4 GHz	2462	16.50	45	6.5	18\13	93.5	3.4	9.8		10.1 -MEASURE-	> 50 mm	> 50 mm	14.1 -MEASURE-	7.1 -MEASURE-	N/A
WiFi 1	Wi-Fi 5.2 GHz	5240	16.00	40	6.5	18\13	93.5	3.4	9.8		13.1 -MEASURE-	> 50 mm	> 50 mm	18.3 -MEASURE-	9.2 -MEASURE-	N/A
WiFi 1	Wi-Fi 5.3 GHz	5300	16.00	40	6.5	18\13	93.5	3.4	9.8		13.2 -MEASURE-	> 50 mm	> 50 mm	18.4 -MEASURE-	9.2 -MEASURE-	N/A
WiFi 1	Wi-Fi 5.5 GHz	5680	15.50	35	6.5	18\13	93.5	3.4	9.8		11.9 -MEASURE-	> 50 mm	> 50 mm	16.7 -MEASURE-	8.3 -MEASURE-	N/A
WiFi 1	Wi-Fi 5.8 GHz	5825	15.50	35	6.5	18\13	93.5	3.4	9.8		12.1 -MEASURE-	> 50 mm	> 50 mm	16.9 -MEASURE-	8.4 -MEASURE-	N/A
WiFi 1	Bluetooth	2480	12.00	16	6.5	18\13	93.5	3.4	9.8		3.6 -MEASURE-	> 50 mm	> 50 mm	5 -MEASURE-	3 -EXEMPT-	N/A
WiFi 2																
WiFi 2	Wi-Fi 2.4 GHz	2462	16.50	45	6.5	19\11	14.4	3.4	93.5		10.1 -MEASURE-	> 50 mm	5 -MEASURE-	14.1 -MEASURE-	> 50 mm	N/A
WiFi 2	Wi-Fi 5.2 GHz	5240	16.00	40	6.5	19\11	14.4	3.4	93.5		13.1 -MEASURE-	> 50 mm	6.5 -MEASURE-	18.3 -MEASURE-	> 50 mm	N/A
WiFi 2	Wi-Fi 5.3 GHz	5300	16.00	40	6.5	19\11	14.4	3.4	93.5		13.2 -MEASURE-	> 50 mm	6.6 -MEASURE-	18.4 -MEASURE-	> 50 mm	N/A
WiFi 2	Wi-Fi 5.5 GHz	5680	15.50	35	6.5	19\11	14.4	3.4	93.5		11.9 -MEASURE-	> 50 mm	6 -MEASURE-	16.7 -MEASURE-	> 50 mm	N/A
WiFi 2	Wi-Fi 5.8 GHz	5825	15.50	35	6.5	19\11	14.4	3.4	93.5		12.1 -MEASURE-	> 50 mm	6 -MEASURE-	16.9 -MEASURE-	> 50 mm	N/A

Note(s):

1. According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.

Antennas > 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
WiFi 1 / Bluetooth																
WiFi 1	Wi-Fi 2.4 GHz	2462	16.50	45	6.5	18\13	93.5	3.4	9.8		< 50 mm	1408.6 mW -EXEMPT-	530.6 mW -EXEMPT-	< 50 mm	< 50 mm	N/A
WiFi 1	Wi-Fi 5.2 GHz	5240	16.00	40	6.5	18\13	93.5	3.4	9.8		< 50 mm	1378.5 mW -EXEMPT-	500.5 mW -EXEMPT-	< 50 mm	< 50 mm	N/A
WiFi 1	Wi-Fi 5.3 GHz	5300	16.00	40	6.5	18\13	93.5	3.4	9.8		< 50 mm	1378.2 mW -EXEMPT-	500.2 mW -EXEMPT-	< 50 mm	< 50 mm	N/A
WiFi 1	Wi-Fi 5.5 GHz	5680	15.50	35	6.5	18\13	93.5	3.4	9.8		< 50 mm	1375.9 mW -EXEMPT-	497.9 mW -EXEMPT-	< 50 mm	< 50 mm	N/A
WiFi 1	Wi-Fi 5.8 GHz	5825	15.50	35	6.5	18\13	93.5	3.4	9.8		< 50 mm	1375.2 mW -EXEMPT-	497.2 mW -EXEMPT-	< 50 mm	< 50 mm	N/A
WiFi 1	Bluetooth	2480	12.00	16	6.5	18\13	93.5	3.4	9.8		< 50 mm	1408.3 mW -EXEMPT-	530.3 mW -EXEMPT-	< 50 mm	< 50 mm	N/A
WiFi 2																
WiFi 2	Wi-Fi 2.4 GHz	2462	16.50	45	6.5	19\11	14.4	3.4	93.5		< 50 mm	1506.6 mW -EXEMPT-	< 50 mm	< 50 mm	530.6 mW -EXEMPT-	N/A
WiFi 2	Wi-Fi 5.2 GHz	5240	16.00	40	6.5	19\11	14.4	3.4	93.5		< 50 mm	1476.5 mW -EXEMPT-	< 50 mm	< 50 mm	500.5 mW -EXEMPT-	N/A
WiFi 2	Wi-Fi 5.3 GHz	5300	16.00	40	6.5	19\11	14.4	3.4	93.5		< 50 mm	1476.2 mW -EXEMPT-	< 50 mm	< 50 mm	500.2 mW -EXEMPT-	N/A
WiFi 2	Wi-Fi 5.5 GHz	5680	15.50	35	6.5	19\11	14.4	3.4	93.5		< 50 mm	1473.9 mW -EXEMPT-	< 50 mm	< 50 mm	497.9 mW -EXEMPT-	N/A
WiFi 2	Wi-Fi 5.8 GHz	5825	15.50	35	6.5	19\11	14.4	3.4	93.5		< 50 mm	1473.2 mW -EXEMPT-	< 50 mm	< 50 mm	497.2 mW -EXEMPT-	N/A

Note(s):

1. According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.

7.1.2. SAR Test Exclusion Calculations for Wi-Fi MIMO (2 Tx) Transmit Conditions

Antennas < 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Wi-Fi 1 / Bluetooth																
WiFi 1	Wi-Fi 2.4 GHz	2457	16.50	45	6.5	18.13	93.5	3.4	9.8		10.1 -MEASURE-	> 50 mm	> 50 mm	14.1 -MEASURE-	7.1 -MEASURE-	N/A
WiFi 1	Wi-Fi 5.2 GHz	5230	16.00	40	6.5	18.13	93.5	3.4	9.8		13.1 -MEASURE-	> 50 mm	> 50 mm	18.3 -MEASURE-	9.1 -MEASURE-	N/A
WiFi 1	Wi-Fi 5.3 GHz	5300	16.00	40	6.5	18.13	93.5	3.4	9.8		13.2 -MEASURE-	> 50 mm	> 50 mm	18.4 -MEASURE-	9.2 -MEASURE-	N/A
WiFi 1	Wi-Fi 5.5 GHz	5680	15.50	35	6.5	18.13	93.5	3.4	9.8		11.9 -MEASURE-	> 50 mm	> 50 mm	16.7 -MEASURE-	8.3 -MEASURE-	N/A
WiFi 1	Wi-Fi 5.8 GHz	5825	15.50	35	6.5	18.13	93.5	3.4	9.8		12.1 -MEASURE-	> 50 mm	> 50 mm	16.9 -MEASURE-	8.4 -MEASURE-	N/A
Wi-Fi 2																
WiFi 2	Wi-Fi 2.4 GHz	2457	16.50	45	6.5	19.11	14.4	3.4	93.5		10.1 -MEASURE-	> 50 mm	5 -MEASURE-	14.1 -MEASURE-	> 50 mm	N/A
WiFi 2	Wi-Fi 5.2 GHz	5230	16.00	40	6.5	19.11	14.4	3.4	93.5		13.1 -MEASURE-	> 50 mm	6.5 -MEASURE-	18.3 -MEASURE-	> 50 mm	N/A
WiFi 2	Wi-Fi 5.3 GHz	5300	16.00	40	6.5	19.11	14.4	3.4	93.5		13.2 -MEASURE-	> 50 mm	6.6 -MEASURE-	18.4 -MEASURE-	> 50 mm	N/A
WiFi 2	Wi-Fi 5.5 GHz	5680	15.50	35	6.5	19.11	14.4	3.4	93.5		11.9 -MEASURE-	> 50 mm	6 -MEASURE-	16.7 -MEASURE-	> 50 mm	N/A
WiFi 2	Wi-Fi 5.8 GHz	5825	15.50	35	6.5	19.11	14.4	3.4	93.5		12.1 -MEASURE-	> 50 mm	6 -MEASURE-	16.9 -MEASURE-	> 50 mm	N/A

Note(s):

1. According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.

Antennas > 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
WiFi 1 / Bluetooth																
WiFi 1	Wi-Fi 2.4 GHz	2457	16.50	45	6.5	18.13	93.5	3.4	9.8		< 50 mm	1408.7 mW -EXEMPT-	530.7 mW -EXEMPT-	< 50 mm	< 50 mm	N/A
WiFi 1	Wi-Fi 5.2 GHz	5230	16.00	40	6.5	18.13	93.5	3.4	9.8		< 50 mm	1378.6 mW -EXEMPT-	500.6 mW -EXEMPT-	< 50 mm	< 50 mm	N/A
WiFi 1	Wi-Fi 5.3 GHz	5300	16.00	40	6.5	18.13	93.5	3.4	9.8		< 50 mm	1378.2 mW -EXEMPT-	500.2 mW -EXEMPT-	< 50 mm	< 50 mm	N/A
WiFi 1	Wi-Fi 5.5 GHz	5680	15.50	35	6.5	18.13	93.5	3.4	9.8		< 50 mm	1375.9 mW -EXEMPT-	497.9 mW -EXEMPT-	< 50 mm	< 50 mm	N/A
WiFi 1	Wi-Fi 5.8 GHz	5825	15.50	35	6.5	18.13	93.5	3.4	9.8		< 50 mm	1375.2 mW -EXEMPT-	497.2 mW -EXEMPT-	< 50 mm	< 50 mm	N/A
WiFi 2																
WiFi 2	Wi-Fi 2.4 GHz	2457	16.50	45	6.5	19.11	14.4	3.4	93.5		< 50 mm	1506.7 mW -EXEMPT-	< 50 mm	< 50 mm	530.7 mW -EXEMPT-	N/A
WiFi 2	Wi-Fi 5.2 GHz	5230	16.00	40	6.5	19.11	14.4	3.4	93.5		< 50 mm	1476.6 mW -EXEMPT-	< 50 mm	< 50 mm	500.6 mW -EXEMPT-	N/A
WiFi 2	Wi-Fi 5.3 GHz	5300	16.00	40	6.5	19.11	14.4	3.4	93.5		< 50 mm	1476.2 mW -EXEMPT-	< 50 mm	< 50 mm	500.2 mW -EXEMPT-	N/A
WiFi 2	Wi-Fi 5.5 GHz	5680	15.50	35	6.5	19.11	14.4	3.4	93.5		< 50 mm	1473.9 mW -EXEMPT-	< 50 mm	< 50 mm	497.9 mW -EXEMPT-	N/A
WiFi 2	Wi-Fi 5.8 GHz	5825	15.50	35	6.5	19.11	14.4	3.4	93.5		< 50 mm	1473.2 mW -EXEMPT-	< 50 mm	< 50 mm	497.2 mW -EXEMPT-	N/A

Note(s):

1. 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

Based on Section 7.1, the test configurations required for this device were determined to be as follows:

Test Configurations	Wi-Fi 1 (SISO)	Wi-Fi 2 (SISO)	Wi-Fi 1 (MIMO)	Wi-Fi 2 (MIMO)
Rear	Yes	Yes	Yes	Yes
Edge 1 (Top)	No	No	No	No
Edge 2 (Right)	No	Yes	No	Yes
Edge 3 (Bottom)	Yes	Yes	Yes	Yes
Edge 4 (Left)	Yes	No	Yes	No

8. RF Output Power Measurement

8.1. WiFi (2.4 GHz Band)

Required Test Channels per KDB 248227 D01

Mode	Band	GHz	Channel	"Default Test Channels"	
				802.11b	802.11g
802.11b/g	2.4 GHz	**2.412**	1#	√	∇
		2.437	6	√	∇
		2.462	11#	√	∇

Notes:
√ = "default test channels"
∇ = possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"
= when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

Measured Results

Band (GHz)	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Avg Pwr (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
2.4	802.11b	1 Tx	1	2412	16.5		Yes
			6	2437	16.5		
			11	2462	16.5		
			12	2467	15.5		
			13	2472	14.5		
			1	2412		16.5	
			6	2437		16.5	
			11	2462		16.5	
			12	2467		15.5	
			13	2472		14.5	
	802.11g	1 Tx	1	2412	16.0		No
			2	2417	16.5		
			6	2437	16.5		
			10	2457	16.5		
			11	2462	15.5		
			12	2467	11.5		
			13	2472	4.0		
			1	2412		16.0	
			2	2417		16.5	
			6	2437		16.5	
			10	2457		16.5	
			11	2462		15.5	
			12	2467		11.5	
			13	2472		4.0	
		2 Tx CDD	1	2412	14.5	14.5	Yes
			2	2417	16.5	16.5	
			6	2437	16.5	16.5	
			10	2457	16.5	16.4	
			11	2462	14.5	14.5	
			12	2467	9.5	9.5	
			13	2472	2.0	2.0	

Note(s):

1. Per KDB 248227 D01, SAR is not required for 802.11g/HT20 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.
2. Additionally, SAR is not required for Channels 12 and 13 because the tune-up limit and the measured output power for these two channels are no greater than those for the default test channels.

Band (GHz)	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Avg Pwr (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
2.4	802.11n	1 Tx HT20	1	2412	16.0		No
			2	2417	16.5		
			6	2437	16.5		
			10	2457	16.5		
			11	2462	15.5		
			12	2467	11.5		
			13	2472	4.0		
			1	2412		16.0	
			2	2417		16.5	
			6	2437		16.5	
			10	2457		16.5	
			11	2462		15.5	
			12	2467		11.5	
			13	2472		4.0	
		2 Tx HT20 CDD	1	2412	14.5	14.5	No
			2	2417	16.5	16.4	
			6	2437	16.5	16.5	
			10	2457	16.5	16.5	
			11	2462	14.4	14.4	
			12	2467	9.5	9.5	
			13	2472	2.0	2.0	
		2 Tx HT20 STBC	1	2412	14.5	14.5	No
			2	2417	16.5	16.5	
			6	2437	16.5	16.5	
			10	2457	16.4	16.5	
			11	2462	14.4	14.4	
			12	2467	9.5	9.5	
			13	2472	2.0	2.0	
		2 Tx HT20 SDM	1	2412	14.5	14.5	No
			2	2417	16.5	16.5	
			6	2437	16.5	16.5	
			10	2457	16.5	16.5	
			11	2462	14.4	14.4	
			12	2467	9.5	9.5	
			13	2472	2.0	2.0	

Power measurements to determine worst-case data rates

Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr		SAR test (Yes/No)
				WiFi 1	WiFi 2	
802.11b	6	2437	1 Mbps	16.5	16.5	Yes
			2 Mbps	16.5	16.5	No
			5.5 Mbps	16.5	16.4	No
			11 Mbps	16.5	16.5	No

8.2. WiFi (5 GHz Bands)

WiFi 5 GHz Bands Measured Results

Band (GHz)	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Avg Pwr (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
5.2	802.11a	1 Tx	36	5180	16.0		Yes
			40	5200	16.0		
			44	5220	16.0		
			48	5240	16.0		
			36	5180		16.0	
			40	5200		16.0	
			44	5220		16.0	
			48	5240		16.0	
		2 Tx CDD	36	5180	16.0	15.9	Yes
			40	5200	16.0	15.8	
			44	5220	16.0	15.8	
			48	5240	16.0	16.0	
	802.11n	1 Tx HT20	36	5180	16.0		No
			40	5200	16.0		
			48	5240	16.0		
			36	5180		16.0	
			40	5200		16.0	
			48	5240		16.0	
		1 Tx HT40	38	5180	13.4		No
			46	5230	16.0		
			38	5180		13.5	
			46	5230		16.0	
		2 Tx HT20 CDD	36	5180	16.0	16.0	No
			40	5200	16.0	16.0	
			48	5240	16.0	16.0	
		2 Tx HT20 STBC	36	5180	16.0	16.0	No
			40	5200	16.0	16.0	
			48	5240	16.0	16.0	
		2 Tx HT20 SDM	36	5180	16.0	16.0	No
			40	5200	16.0	16.0	
			48	5240	16.0	16.0	
		2 Tx HT40 CDD	38	5190	11.2	11.5	No
			46	5230	15.4	16.0	
		2 Tx HT40 STBC	38	5190	11.5	11.2	No
			46	5230	16.0	15.8	
		2 Tx HT40 SDM	38	5190	11.5	11.5	No
			46	5230	16.0	16.0	

Note(s):

Per KDB 248227, SAR is not required for 802.11n HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a/b channels.

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Avg Pwr (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
5.3	802.11a	1 Tx	52	5260	16.0		Yes
			56	5280	16.0		
			60	5300	16.0		
			64	5320	15.0		
			52	5260		16.0	
			56	5280		16.0	
			60	5300		16.0	
			64	5320		15.0	
		2 Tx CDD	52	5260	15.9	15.9	Yes
			56	5280	16.0	16.0	
			60	5300	16.0	16.0	
			64	5320	14.0	14.0	
	802.11n	1 Tx HT20	52	5260	15.9		No
			60	5300	16.0		
			64	5320	15.0		
			52	5260		15.9	
			60	5300		16.0	
			64	5320		15.0	
		1 Tx HT40	54	5270	16.0		No
			62	5310	13.5		
			54	5270		16.0	
			62	5310		13.5	
		2 Tx HT20 CDD	52	5260	15.9	15.9	No
			56	5280	15.9	15.9	
			60	5300	15.9	16.0	
			64	5320	14.0	14.0	
		2 Tx HT20 STBC	52	5260	16.0	16.0	No
			56	5280	16.0	16.0	
			60	5300	15.9	16.0	
			64	5320	14.0	14.0	
		2 Tx HT20 SDM	52	5260	16.0	16.0	No
			56	5280	16.0	16.0	
			60	5300	16.0	16.0	
			64	5320	14.0	14.0	
		2 Tx HT40 CDD	54	5270	15.4	16.0	No
			62	5310	11.2	11.5	
		2 Tx HT40 STBC	54	5270	15.4	15.9	No
			62	5310	11.2	11.4	
		2 Tx HT40 SDM	54	5270	15.4	15.9	No
			62	5310	11.2	11.5	

Note(s):

Per KDB 248227, SAR is not required for 802.11n HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a channels.

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Avg Pwr (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
5.5	802.11a	1 Tx	100	5500	14.0		Yes
			104	5520	15.5		
			108	5540	15.5		
			112	5560	15.5		
			116	5580	15.5		
			120	5600	15.5		
			124	5620	15.5		
			128	5640	15.5		
			132	5660	15.5		
			136	5680	15.5		
			140	5700	14.0		
			100	5500		14.0	
			104	5520		15.4	
			108	5540		15.4	
			112	5560		15.4	
			116	5580		15.4	
			120	5600		15.4	
			124	5620		15.4	
			128	5640		15.4	
			132	5660		15.4	
			136	5680		15.3	
			140	5700		14.0	
		2 Tx CDD	100	5500	13.5	13.5	Yes
			104	5520	15.0	15.0	
			108	5540	15.0	15.0	
			112	5560	15.0	15.0	
			116	5580	14.9	15.0	
			120	5600	14.9	15.0	
			124	5620	14.8	15.1	
			128	5640	15.0	15.0	
			132	5660	15.0	15.0	
			136	5680	15.0	15.0	
			140	5700	12.8	13.0	

Note(s):

Per KDB 248227, SAR is not required for 802.11n HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a channels.

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Avg Pwr (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
5.5	802.11n	1 Tx HT20	100	5500	14.0		No
			104	5520	15.4		
			120	5600	15.5		
			136	5680	15.5		
			140	5700	14.0		
			100	5500		14.0	
			104	5520		15.4	
			120	5600		15.5	
			136	5680		15.4	
			140	5700		14.0	
		1 Tx HT40	102	5510	14.0		No
			110	5550	15.5		
			134	5670	15.5		
			102	5510		14.0	
			110	5550		15.5	
			134	5670		15.5	
		2 Tx HT20 CDD	100	5500	13.5	13.2	No
			104	5520	15.0	15.0	
			120	5600	15.0	15.0	
			136	5680	15.0	15.1	
			140	5700	13.0	12.8	
		2 Tx HT20 STBC	100	5500	13.5	13.5	No
			104	5520	15.1	15.0	No
			120	5600	15.1	15.0	
			136	5680	15.1	15.0	
			140	5700	13.0	13.0	No
		2 Tx HT20 SDM	100	5500	13.5	13.2	No
			104	5520	15.1	15.1	
			120	5600	15.1	15.1	
			136	5680	15.1	15.1	
			140	5700	13.0	12.8	
		2 Tx HT40 CDD	102	5510	12.0	11.7	No
			110	5550	15.2	15.2	
			134	5670	15.0	15.0	
		2 Tx HT40 STBC	102	5510	12.0	11.7	No
			110	5550	15.1	15.2	
			134	5670	15.0	15.0	
		2 Tx HT40 SDM	102	5510	12.0	11.7	No
			110	5550	15.2	15.2	
			134	5670	15.0	14.9	

Note(s):

Per KDB 248227, SAR is not required for 802.11n HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a channels.

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Avg Pwr (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
5.8	802.11a	1 Tx	149	5745	15.0		Yes
			153	5765	15.5		
			157	5785	15.5		
			161	5805	15.5		
			165	5825	15.5		
			149	5745		15.0	
			153	5765		15.4	
			157	5785		15.5	
			161	5805		15.5	
			165	5825		15.5	
		2 Tx CDD	149	5745	13.0	13.0	Yes
			153	5765	15.5	15.5	
			157	5785	15.4	15.4	
			161	5805	15.4	15.4	
			165	5825	15.5	15.5	
	802.11n	1 Tx HT20	149	5745	15.0		No
			157	5785	15.5		
			165	5825	15.5		
			149	5745		15.0	
			157	5785		15.5	
			165	5825		15.5	
		1 Tx HT40	151	5755	11.5		No
			159	5795	15.5		
			151	5755		11.4	
			159	5795		15.5	
		2 Tx HT20 CDD	149	5745	13.0	13.0	No
			157	5785	15.5	15.5	
			165	5825	15.5	15.5	
		2 Tx HT20 STBC	149	5745	13.0	13.0	No
			157	5785	15.5	15.5	
			165	5825	15.5	15.5	
		2 Tx HT20 SDM	149	5745	13.0	13.0	No
			157	5785	15.5	15.5	
			165	5825	15.5	15.5	
		2 Tx HT40 CDD	151	5755	8.8	9.0	No
			159	5795	15.5	15.5	
		2 Tx HT40 STBC	151	5755	8.8	9.0	No
			159	5795	15.4	15.5	
		2 Tx HT40 SDM	151	5755	8.8	8.9	No
			159	5795	15.5	15.5	

Note(s):

Per KDB 248227, SAR is not required for 802.11n HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a channels.

Power measurements to determine worst-case data rates

Band	Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)		SAR test (Yes/No)
					WiFi 1	WiFi 2	
5.2 GHz	802.11a	36	5180	6 Mbps	16.0	16.0	Yes
				9 Mbps	16.0	16.0	No
				12 Mbps	16.0	16.0	No
				18 Mbps	16.0	16.0	No
				24 Mbps	16.0	16.0	No
				36 Mbps	16.0	16.0	No
				48 Mbps	16.0	16.0	No
				54 Mbps	16.0	16.0	No
5.3 GHz	802.11a	52	5260	6 Mbps	16.0	16.0	Yes
				9 Mbps	16.0	16.0	No
				12 Mbps	16.0	16.0	No
				18 Mbps	16.0	16.0	No
				24 Mbps	15.9	15.9	No
				36 Mbps	16.0	16.0	No
				48 Mbps	16.0	16.0	No
				54 Mbps	15.9	16.0	No
5.5 GHz	802.11a	104	5520	6 Mbps	15.5	15.4	Yes
				9 Mbps	15.5	15.4	No
				12 Mbps	15.5	15.4	No
				18 Mbps	15.5	15.3	No
				24 Mbps	15.5	15.3	No
				36 Mbps	15.5	15.4	No
				48 Mbps	15.5	15.4	No
				54 Mbps	15.5	15.4	No
5.8 GHz	802.11a	165	5825	6 Mbps	15.0	15.0	Yes
				9 Mbps	15.0	15.0	No
				12 Mbps	15.0	15.0	No
				18 Mbps	15.0	14.9	No
				24 Mbps	15.0	15.0	No
				36 Mbps	15.0	15.0	No
				48 Mbps	15.0	15.0	No
				54 Mbps	15.0	15.0	No

8.3. Bluetooth

Band (GHz)	Mode	Ch #	Freq. (MHz)	Avg Power (dBm)
2.4	V3.0 + EDR, GFSK	0	2402	12.0
		39	2441	11.8
		78	2480	11.9
	V3.0 + EDR, 8-DPSK	0	2402	9.6
		39	2441	9.9
		78	2480	9.8
	V4.0 LE, GFSK	0	2402	8.3
		19	2440	9.0
		39	2480	9.0

9. 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.

9.1. 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

9.2. Dielectric Property Measurements Results

SAR Lab B

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
7/24/2014	Body 2450	e'	51.5700	Relative Permittivity (ε_r):	51.57	52.70	-2.14	5
		e''	13.7100	Conductivity (σ):	1.87	1.95	-4.22	5
	Body 2410	e'	51.6300	Relative Permittivity (ε_r):	51.63	52.76	-2.14	5
		e''	13.6500	Conductivity (σ):	1.83	1.91	-4.11	5
	Body 2475	e'	51.5200	Relative Permittivity (ε_r):	51.52	52.67	-2.18	5
		e''	13.7400	Conductivity (σ):	1.89	1.99	-4.75	5
7/28/2014	Body 2450	e'	51.0500	Relative Permittivity (ε_r):	51.05	52.70	-3.13	5
		e''	13.7300	Conductivity (σ):	1.87	1.95	-4.08	5
	Body 2410	e'	51.1700	Relative Permittivity (ε_r):	51.17	52.76	-3.01	5
		e''	13.6800	Conductivity (σ):	1.83	1.91	-3.90	5
	Body 2475	e'	50.9600	Relative Permittivity (ε_r):	50.96	52.67	-3.24	5
		e''	13.8200	Conductivity (σ):	1.90	1.99	-4.19	5
7/30/2014	Body 2450	e'	50.6800	Relative Permittivity (ε_r):	50.68	52.70	-3.83	5
		e''	14.8700	Conductivity (σ):	2.03	1.95	3.88	5
	Body 2410	e'	50.8100	Relative Permittivity (ε_r):	50.81	52.76	-3.69	5
		e''	14.7900	Conductivity (σ):	1.98	1.91	3.90	5
	Body 2475	e'	50.6200	Relative Permittivity (ε_r):	50.62	52.67	-3.89	5
		e''	14.9200	Conductivity (σ):	2.05	1.99	3.43	5

SAR Lab D

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
7/23/2014	Body 5180	e'	47.0900	Relative Permittivity (ε_r):	47.09	49.05	-3.99	5
		e''	17.6500	Conductivity (σ):	5.08	5.27	-3.56	5
	Body 5200	e'	47.0400	Relative Permittivity (ε_r):	47.04	49.02	-4.04	5
		e''	17.6600	Conductivity (σ):	5.11	5.29	-3.56	5
	Body 5600	e'	46.4900	Relative Permittivity (ε_r):	46.49	48.48	-4.10	5
		e''	17.8900	Conductivity (σ):	5.57	5.76	-3.31	5
	Body 5800	e'	46.2000	Relative Permittivity (ε_r):	46.20	48.20	-4.15	5
		e''	18.0700	Conductivity (σ):	5.83	6.00	-2.87	5
	Body 5825	e'	46.1600	Relative Permittivity (ε_r):	46.16	48.20	-4.23	5
		e''	18.1000	Conductivity (σ):	5.86	6.00	-2.29	5
7/28/2014	Body 5180	e'	50.5900	Relative Permittivity (ε_r):	50.59	49.05	3.15	5
		e''	18.0400	Conductivity (σ):	5.20	5.27	-1.43	5
	Body 5200	e'	50.5700	Relative Permittivity (ε_r):	50.57	49.02	3.16	5
		e''	18.0800	Conductivity (σ):	5.23	5.29	-1.27	5
	Body 5600	e'	50.0300	Relative Permittivity (ε_r):	50.03	48.48	3.20	5
		e''	18.4100	Conductivity (σ):	5.73	5.76	-0.50	5
	Body 5800	e'	49.6800	Relative Permittivity (ε_r):	49.68	48.20	3.07	5
		e''	18.6200	Conductivity (σ):	6.00	6.00	0.08	5
	Body 5825	e'	49.6600	Relative Permittivity (ε_r):	49.66	48.20	3.03	5
		e''	18.7200	Conductivity (σ):	6.06	6.00	1.05	5
7/30/2014	Body 5180	e'	48.8600	Relative Permittivity (ε_r):	48.86	49.05	-0.38	5
		e''	18.6700	Conductivity (σ):	5.38	5.27	2.01	5
	Body 5200	e'	48.8400	Relative Permittivity (ε_r):	48.84	49.02	-0.37	5
		e''	18.6700	Conductivity (σ):	5.40	5.29	1.95	5
	Body 5600	e'	48.1700	Relative Permittivity (ε_r):	48.17	48.48	-0.63	5
		e''	19.1500	Conductivity (σ):	5.96	5.76	3.50	5
	Body 5800	e'	47.8300	Relative Permittivity (ε_r):	47.83	48.20	-0.77	5
		e''	19.3600	Conductivity (σ):	6.24	6.00	4.06	5
	Body 5825	e'	47.8300	Relative Permittivity (ε_r):	47.83	48.20	-0.77	5
		e''	19.3600	Conductivity (σ):	6.27	6.00	4.51	5

SAR Lab E

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
7/23/2014	Body 5180	e'	47.4200	Relative Permittivity (ϵ_r):	47.42	49.05	-3.32	5
		e''	18.1700	Conductivity (σ):	5.23	5.27	-0.72	5
	Body 5200	e'	47.3900	Relative Permittivity (ϵ_r):	47.39	49.02	-3.32	5
		e''	18.1800	Conductivity (σ):	5.26	5.29	-0.72	5
	Body 5600	e'	46.8100	Relative Permittivity (ϵ_r):	46.81	48.48	-3.44	5
		e''	18.3500	Conductivity (σ):	5.71	5.76	-0.82	5
	Body 5800	e'	46.5000	Relative Permittivity (ϵ_r):	46.50	48.20	-3.53	5
		e''	18.5000	Conductivity (σ):	5.97	6.00	-0.56	5
	Body 5825	e'	46.4700	Relative Permittivity (ϵ_r):	46.47	48.20	-3.59	5
		e''	18.5300	Conductivity (σ):	6.00	6.00	0.03	5
7/28/2014	Body 5180	e'	49.1900	Relative Permittivity (ϵ_r):	49.19	49.05	0.29	5
		e''	18.3700	Conductivity (σ):	5.29	5.27	0.37	5
	Body 5200	e'	49.1600	Relative Permittivity (ϵ_r):	49.16	49.02	0.29	5
		e''	18.3900	Conductivity (σ):	5.32	5.29	0.43	5
	Body 5600	e'	48.6100	Relative Permittivity (ϵ_r):	48.61	48.48	0.27	5
		e''	18.6500	Conductivity (σ):	5.81	5.76	0.80	5
	Body 5800	e'	48.2600	Relative Permittivity (ϵ_r):	48.26	48.20	0.12	5
		e''	18.8800	Conductivity (σ):	6.09	6.00	1.48	5
	Body 5825	e'	48.2500	Relative Permittivity (ϵ_r):	48.25	48.20	0.10	5
		e''	18.9400	Conductivity (σ):	6.13	6.00	2.24	5
7/30/2014	Body 5180	e'	48.1300	Relative Permittivity (ϵ_r):	48.13	49.05	-1.87	5
		e''	18.7200	Conductivity (σ):	5.39	5.27	2.28	5
	Body 5200	e'	48.0900	Relative Permittivity (ϵ_r):	48.09	49.02	-1.90	5
		e''	18.7400	Conductivity (σ):	5.42	5.29	2.34	5
	Body 5600	e'	47.4800	Relative Permittivity (ϵ_r):	47.48	48.48	-2.06	5
		e''	19.1100	Conductivity (σ):	5.95	5.76	3.29	5
	Body 5800	e'	47.1200	Relative Permittivity (ϵ_r):	47.12	48.20	-2.24	5
		e''	19.2900	Conductivity (σ):	6.22	6.00	3.68	5
	Body 5825	e'	47.1300	Relative Permittivity (ϵ_r):	47.13	48.20	-2.22	5
		e''	19.3500	Conductivity (σ):	6.27	6.00	4.45	5
8/4/2014	Body 5180	e'	48.2100	Relative Permittivity (ϵ_r):	48.21	49.05	-1.71	5
		e''	18.4300	Conductivity (σ):	5.31	5.27	0.70	5
	Body 5200	e'	48.1800	Relative Permittivity (ϵ_r):	48.18	49.02	-1.71	5
		e''	18.5300	Conductivity (σ):	5.36	5.29	1.19	5
	Body 5600	e'	47.5700	Relative Permittivity (ϵ_r):	47.57	48.48	-1.87	5
		e''	18.8400	Conductivity (σ):	5.87	5.76	1.83	5
	Body 5800	e'	47.3200	Relative Permittivity (ϵ_r):	47.32	48.20	-1.83	5
		e''	18.9500	Conductivity (σ):	6.11	6.00	1.86	5
	Body 5825	e'	47.3000	Relative Permittivity (ϵ_r):	47.30	48.20	-1.87	5
		e''	19.0400	Conductivity (σ):	6.17	6.00	2.78	5

SAR Lab F

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
7/23/2014	Body 5180	e'	47.4000	Relative Permittivity (ϵ_r):	47.40	49.05	-3.36	5
		e''	18.0600	Conductivity (σ):	5.20	5.27	-1.32	5
	Body 5200	e'	47.3700	Relative Permittivity (ϵ_r):	47.37	49.02	-3.37	5
		e''	18.0500	Conductivity (σ):	5.22	5.29	-1.43	5
	Body 5600	e'	46.7900	Relative Permittivity (ϵ_r):	46.79	48.48	-3.48	5
		e''	18.2300	Conductivity (σ):	5.68	5.76	-1.47	5
	Body 5800	e'	46.4700	Relative Permittivity (ϵ_r):	46.47	48.20	-3.59	5
		e''	18.4000	Conductivity (σ):	5.93	6.00	-1.10	5
	Body 5825	e'	46.4500	Relative Permittivity (ϵ_r):	46.45	48.20	-3.63	5
		e''	18.4300	Conductivity (σ):	5.97	6.00	-0.51	5
7/28/2014	Body 5180	e'	48.0900	Relative Permittivity (ϵ_r):	48.09	49.05	-1.95	5
		e''	18.7200	Conductivity (σ):	5.39	5.27	2.28	5
	Body 5200	e'	48.0200	Relative Permittivity (ϵ_r):	48.02	49.02	-2.04	5
		e''	18.7400	Conductivity (σ):	5.42	5.29	2.34	5
	Body 5600	e'	47.4200	Relative Permittivity (ϵ_r):	47.42	48.48	-2.18	5
		e''	19.0900	Conductivity (σ):	5.94	5.76	3.18	5
	Body 5800	e'	47.0500	Relative Permittivity (ϵ_r):	47.05	48.20	-2.39	5
		e''	19.2700	Conductivity (σ):	6.21	6.00	3.58	5
	Body 5825	e'	47.0200	Relative Permittivity (ϵ_r):	47.02	48.20	-2.45	5
		e''	19.3600	Conductivity (σ):	6.27	6.00	4.51	5
7/30/2014	Body 5180	e'	49.6100	Relative Permittivity (ϵ_r):	49.61	49.05	1.15	5
		e''	18.1700	Conductivity (σ):	5.23	5.27	-0.72	5
	Body 5200	e'	49.5900	Relative Permittivity (ϵ_r):	49.59	49.02	1.16	5
		e''	18.1900	Conductivity (σ):	5.26	5.29	-0.67	5
	Body 5600	e'	49.0200	Relative Permittivity (ϵ_r):	49.02	48.48	1.12	5
		e''	18.6200	Conductivity (σ):	5.80	5.76	0.64	5
	Body 5800	e'	48.7000	Relative Permittivity (ϵ_r):	48.70	48.20	1.04	5
		e''	18.8300	Conductivity (σ):	6.07	6.00	1.21	5
	Body 5825	e'	48.7100	Relative Permittivity (ϵ_r):	48.71	48.20	1.06	5
		e''	18.8800	Conductivity (σ):	6.12	6.00	1.92	5

10. 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 remeasured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

10.1. Reference Target SAR Values

The reference SAR values can be obtained from the calibration certificate of system validation dipoles

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)		
				1g/10g	Head	Body
D2450V2	706	5/20/2014	2450	1g	53.0	50.2
				10g	24.5	23.4
D5GHzV2	1003	2/26/2014	5200	1g	77.7	73.5
				10g	22.2	20.5
			5600	1g	81.8	79.6
				10g	23.2	22.1
			5800	1g	78.3	73.8
				10g	22.1	20.4
D5GHzV2	1168	12/12/2013	5200	1g	79.3	75.2
				10g	22.7	21.0
			5600	1g	85.3	80.6
				10g	24.3	22.3
			5800	1g	81.0	75.7
				10g	22.9	20.9

10.2. 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.

SAR Lab B

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
7/23/2017	D2450V2	706	Body	1g	4.81	4.92	49.2	50.2	-1.99	-2.29	
				10g	2.08	2.25	22.5	23.4	-3.85		
7/28/2014	D2450V2	706	Body	1g	4.76	4.75	47.5	50.2	-5.38	0.21	1,2
				10g	1.99	2.19	21.9	23.4	-6.41		
7/30/2014	D2450V2	706	Body	1g	4.75	4.79	47.9	50.2	-4.58	-0.84	
				10g	2.05	2.21	22.1	23.4	-5.56		

SAR Lab D

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
7/23/2014	D5200V2	1003	Body	1g	6.42	6.87	68.7	73.5	-6.53	-7.01	3,4
				10g	1.79	1.94	19.4	20.5	-5.37		
7/28/2014	D5200V2	1003	Body	1g	6.66	7.07	70.7	73.5	-3.81	-6.16	
				10g	1.84	1.99	19.9	20.5	-2.93		
7/30/2014	D5200V2	1003	Body	1g	6.77	7.20	72.0	73.5	-2.04	-6.35	
				10g	1.86	2.02	20.2	20.5	-1.46		

SAR Lab E

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
7/23/2014	D5600V2	1168	Body	1g	7.31	7.66	76.6	80.6	-4.96	-4.79	
				10g	1.97	2.15	21.5	22.3	-3.59		
7/28/2014	D5600V2	1168	Body	1g	7.91	8.40	84.0	80.6	4.22	-6.19	
				10g	2.13	2.36	23.6	22.3	5.83		
7/30/2014	D5600V2	1168	Body	1g	8.02	8.47	84.7	80.6	5.09	-5.61	5,6
				10g	2.19	2.37	23.7	22.3	6.28		
8/4/2014	D5600V2	1168	Body	1g	7.35	7.83	78.3	80.6	-2.85	-6.53	
				10g	1.99	2.19	21.9	22.3	-1.79		

SAR Lab F

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
7/23/2014	D5800V2	1003	Body	1g	6.81	7.17	71.7	73.8	-2.85	-5.29	7,8
				10g	1.84	2.03	20.3	20.4	-0.49		
7/28/2014	D5800V2	1003	Body	1g	6.79	7.38	73.8	73.8	0.00	-8.69	
				10g	1.84	2.07	20.7	20.4	1.47		
7/30/2014	D5800V2	1003	Body	1g	6.67	7.21	72.1	73.8	-2.30	-8.10	
				10g	1.82	2.02	20.2	20.4	-0.98		

11. SAR Test Results

SAR Test Reduction criteria are as follows:

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

11.1. Wi-Fi 2.4GHz

Variant 1

Band	Mode	No. of Transmitters	Test Position	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)				SAR (W/kg)								Plot No.
							WiFi 1		WiFi 2		WiFi 1				WiFi 2				
							Tune-up Limit	Measured	Tune-up Limit	Measured	Measured		Scaled		Measured		Scaled		
											1-g	10-g	1-g	10-g	1-g	10-g	1-g	10-g	
2.4GHz	802.11b	1 Tx	Rear	0	6	2437	16.5	16.5			0.070	0.031	0.070	0.031					
			Edge 3	0	1	2412	16.5	16.5			0.884	0.282	0.884	0.282					
					6	2437	16.5	16.5			0.965	0.308	0.965	0.308					
					11	2462	16.5	16.5			0.957	0.307	0.957	0.307					
			Edge 4	0	6	2437	16.5	16.5			0.175	0.080	0.175	0.080					
			Rear	0	6	2437			16.5	16.5					0.070	0.030	0.070	0.030	
			Edge 2	0	6	2437			16.5	16.5					0.096	0.042	0.096	0.042	
			Edge 3	0	1	2412			16.5	16.5					0.899	0.284	0.899	0.284	
					6	2437			16.5	16.5					1.180	0.373	1.180	0.373	1
					11	2462			16.5	16.5					1.170	0.373	1.170	0.373	
	802.11g	2 Tx CDD	Rear	0	6	2437	16.5	16.5	16.5	16.5	0.064	0.030	0.064	0.030	0.057	0.024	0.057	0.024	
			Edge 2	0	6	2437	16.5	16.5	16.5	16.5					0.117	0.049	0.117	0.049	
			Edge 3	0	2	2417	16.5	16.5	16.5	16.5	0.926	0.298	0.926	0.298	0.853	0.274	0.853	0.274	
					6	2437	16.5	16.5	16.5	16.5	0.867	0.281	0.867	0.281	1.160	0.368	1.160	0.368	
					10	2457	16.5	16.5	16.5	16.4	0.982	0.319	0.982	0.319	1.110	0.352	1.136	0.360	
			Edge 4	0	6	2437	16.5	16.5	16.5	16.5	0.156	0.071	0.156	0.071					

Variant 2

Band	Mode	No. of Transmitters	Test Position	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)				SAR (W/kg)								Plot No.
							WiFi 1		WiFi 2		WiFi 1				WiFi 2				
							Tune-up Limit	Measured	Tune-up Limit	Measured	Measured		Scaled		Measured		Scaled		
											1-g	10-g	1-g	10-g	1-g	10-g	1-g	10-g	
2.4GHz	802.11b	1 Tx	Edge 3	0	6	2437			16.5	16.5					1.090	0.347	1.090	0.347	

11.2. Wi-Fi 5GHz

11.2.1. 5.2 GHz Band

Variant 1

Band	Mode	No. of Transmitters	Test Position	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)				SAR (W/kg)								Plot No.
							WiFi 1		WiFi 2		WiFi 1				WiFi 2				
							Tune-up Limit	Measured	Tune-up Limit	Measured	Measured		Scaled		Measured		Scaled		
											1-g	10-g	1-g	10-g	1-g	10-g	1-g	10-g	
5.2GHz	802.11a	1 Tx	Rear	0	36	5180	16.0	16.0			0.045	0.016	0.045	0.016					
			Edge 3		36	5180	16.0	16.0			0.586	0.191	0.586	0.191					
			Edge 4		36	5180	16.0	16.0			0.064	0.022	0.064	0.022					
			Rear		36	5180			16.0	16.0					0.070	0.022	0.070	0.022	
			Edge 2		36	5180			16.0	16.0					0.036	0.013	0.036	0.013	
			Edge 3		36	5180			16.0	16.0					0.794	0.223	0.794	0.223	
		2 Tx CDD	Rear	0	36	5180	16.0	16.0	16.0	15.9	0.000	0.000	0.000	0.000	0.019	0.003	0.019	0.003	
			Edge 2		36	5180	16.0	16.0	16.0	15.9					0.066	0.023	0.068	0.023	
			Edge 3		36	5180	16.0	16.0	16.0	15.9	0.628	0.206	0.628	0.206	0.831	0.254	0.850	0.260	
					48	5240	16.0	16.0	16.0	16.0	0.676	0.226	0.676	0.226	0.891	0.264	0.891	0.264	2
			Edge 4		36	5180	16.0	16.0	16.0	15.9	0.033	0.011	0.033	0.011					

Variant 2

Band	Mode	No. of Transmitters	Test Position	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)				SAR (W/kg)								Plot No.
							WiFi 1		WiFi 2		WiFi 1				WiFi 2				
							Tune-up Limit	Measured	Tune-up Limit	Measured	Measured		Scaled		Measured		Scaled		
											1-g	10-g	1-g	10-g	1-g	10-g	1-g	10-g	
5.2GHz	802.11a	2 Tx CDD	Edge 3	0	48	5240	16.0	16.0	16.0	15.9	0.656	0.217	0.656	0.217	0.418	0.120	0.428	0.123	

11.2.2. 5.3 GHz Band

Variant 1

Band	Mode	No. of Transmitters	Test Position	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)				SAR (W/kg)								Plot No.
							WiFi 1		WiFi 2		WiFi 1				WiFi 2				
							Tune-up Limit	Measured	Tune-up Limit	Measured	Measured		Scaled		Measured		Scaled		
											1-g	10-g	1-g	10-g	1-g	10-g	1-g	10-g	
5.3GHz	802.11a	1 Tx	Rear	0	52	5260	16.0	16.0			0.045	0.013	0.045	0.013					
			Edge 3		52	5260	16.0	16.0			0.576	0.190	0.576	0.190					
			Edge 4		52	5260	16.0	16.0			0.085	0.028	0.085	0.028					
			Rear		52	5300			16.0	16.0					0.052	0.020	0.052	0.020	
			Edge 2		52	5260			16.0	16.0					0.040	0.015	0.040	0.015	
			Edge 3		52	5260			16.0	16.0					0.817	0.227	0.817	0.227	
					60	5300			16.0	16.0					0.725	0.210	0.725	0.210	
		2 Tx CDD	Rear	0	60	5300	16.0	16.0	16.0	16.0	0.048	0.017	0.048	0.017	0.052	0.021	0.052	0.021	
			Edge 2		60	5300	16.0	16.0	16.0	16.0					0.152	0.048	0.152	0.048	
			Edge 3		52	5260	16.0	15.9	16.0	15.9	0.760	0.251	0.778	0.257	0.878	0.262	0.898	0.268	3
					60	5300	16.0	16.0	16.0	16.0	0.737	0.252	0.737	0.252	0.858	0.256	0.858	0.256	
			Edge 4		60	5300	16.0	16.0	16.0	16.0	0.036	0.012	0.036	0.012					

Variant 2

Band	Mode	No. of Transmitters	Test Position	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)				SAR (W/kg)								Plot No.
							WiFi 1		WiFi 2		WiFi 1				WiFi 2				
							Tune-up Limit	Measured	Tune-up Limit	Measured	Measured		Scaled		Measured		Scaled		
											1-g	10-g	1-g	10-g	1-g	10-g	1-g	10-g	
5.3GHz	802.11a	2 Tx CDD	Edge 3	0	52	5260	16.0	16.0	16.0	16.0	0.717	0.241	0.717	0.241	0.566	0.161	0.566	0.161	

11.2.3. 5.5 GHz Band

Variant 1

Band	Mode	No. of Transmitters	Test Position	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)				SAR (W/kg)								Plot No.
							WiFi 1		WiFi 2		WiFi 1				WiFi 2				
							Tune-up Limit	Measured	Tune-up Limit	Measured	Measured		Scaled		Measured		Scaled		
											1-g	10-g	1-g	10-g	1-g	10-g	1-g	10-g	
5.5GHz	802.11a	1 Tx	Rear	0	104	5520	15.5	15.5			0.046	0.019	0.046	0.019					
			Edge 3	0	104	5520	15.5	15.5			0.577	0.200	0.577	0.200					
					116	5580	15.5	15.5			0.559	0.193	0.559	0.193					
					124	5620	15.5	15.5			0.553	0.190	0.553	0.190					
					136	5680	15.5	15.5			0.601	0.190	0.601	0.190					
			Edge 4	0	104	5520	15.5	15.5			0.084	0.026	0.084	0.026					
			Rear	0	104	5520			15.5	15.4					0.051	0.018	0.052	0.019	
			Edge 2	0	104	5520			15.5	15.4					0.024	0.009	0.025	0.010	
			Edge 3	0	104	5520			15.5	15.4					0.930	0.285	0.952	0.292	
					116	5580			15.5	15.4					1.020	0.316	1.044	0.323	
					124	5620			15.5	15.4					1.000	0.317	1.023	0.324	
					136	5680			15.5	15.3					0.983	0.316	1.029	0.331	
		2 Tx CDD	Rear	0	104	5520	15.5	15.0	15.5	15.0	0.047	0.017	0.053	0.019	0.050	0.018	0.056	0.021	
			Edge 2	0	104	5520	15.5	15.0	15.5	15.0					0.021	0.006	0.024	0.007	
			Edge 3	0	104	5520	15.5	15.0	15.5	15.0	0.627	0.222	0.704	0.249	0.990	0.309	1.111	0.347	
					116	5580	15.5	14.9	15.5	15.0	0.599	0.208	0.672	0.233	1.040	0.327	1.167	0.367	4
					124	5620	15.5	14.8	15.5	15.1	0.581	0.203	0.667	0.233	1.050	0.317	1.151	0.348	
					136	5680	15.5	15.0	15.5	15.0	0.564	0.200	0.663	0.235	0.995	0.317	1.116	0.356	
			Edge 4	0	104	5520	15.5	15.0	15.5	15.0	0.083	0.024	0.093	0.027					

Variant 2

Band	Mode	No. of Transmitters	Test Position	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)				SAR (W/kg)								Plot No.
							WiFi 1		WiFi 2		WiFi 1				WiFi 2				
							Tune-up Limit	Measured	Tune-up Limit	Measured	Measured		Scaled		Measured		Scaled		
											1-g	10-g	1-g	10-g	1-g	10-g	1-g	10-g	
5.5GHz	802.11a	2 Tx CDD	Edge 3	0	116	5580	15.5	15.5	15.5	15.5	0.564	0.200	0.564	0.200	0.995	0.317	0.995	0.317	

11.2.4. 5.8 GHz Band

Variant 1

Band	Mode	No. of Transmitters	Test Position	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)				SAR (W/kg)								Plot No.
							WiFi 1		WiFi 2		WiFi 1				WiFi 2				
							Tune-up Limit	Measured	Tune-up Limit	Measured	Measured		Scaled		Measured		Scaled		
											1-g	10-g	1-g	10-g	1-g	10-g	1-g	10-g	
5.8GHz	802.11a	1 Tx	Rear	0	165	5825	15.5	15.5			0.053	0.020	0.053	0.020					
			Edge 3	0	153	5765	15.5	15.5			0.691	0.236	0.691	0.236					
					157	5785	15.5	15.5			0.619	0.200	0.619	0.200					
					165	5825	15.5	15.5			0.714	0.232	0.714	0.232					
			Edge 4	0	165	5825	15.5	15.5			0.077	0.029	0.077	0.029					
			Rear	0	165	5825			15.5	15.5					0.100	0.036	0.100	0.036	
			Edge 2	0	165	5825			15.5	15.5					0.042	0.016	0.042	0.016	
			Edge 3	0	153	5765			15.5	15.4					0.872	0.269	0.892	0.275	
					157	5785			15.5	15.5					0.949	0.302	0.949	0.302	
					165	5825			15.5	15.5					1.050	0.332	1.050	0.332	
		2 Tx CDD	Rear	0	165	5825	15.5	15.5	15.5	15.5	0.054	0.020	0.054	0.020	0.124	0.045	0.124	0.045	
			Edge 2	0	165	5825	15.5	15.5	15.5	15.5					0.056	0.019	0.056	0.019	
			Edge 3	0	153	5765	15.5	15.5	15.5	15.5	0.673	0.209	0.673	0.209	0.904	0.283	0.904	0.283	
					157	5785	15.5	15.4	15.5	15.4	0.684	0.232	0.684	0.232	0.907	0.289	0.928	0.296	
					165	5825	15.5	15.5	15.5	15.5	0.851	0.286	0.871	0.293	1.120	0.356	1.120	0.356	5
			Edge 4	0	165	5825	15.5	15.5	15.5	15.5	0.087	0.030	0.087	0.030					

Variant 2

Band	Mode	No. of Transmitters	Test Position	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)				SAR (W/kg)								Plot No.
							WiFi 1		WiFi 2		WiFi 1				WiFi 2				
							Tune-up Limit	Measured	Tune-up Limit	Measured	Measured		Scaled		Measured		Scaled		
											1-g	10-g	1-g	10-g	1-g	10-g	1-g	10-g	
5.8GHz	802.11a	2 Tx CDD	Edge 3	0	165	5825	15.5	15.5	15.5	15.5	0.696	0.222	0.696	0.222	0.849	0.262	0.849	0.262	

11.3. Bluetooth

Variant 1

Mode	Test Position	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		SAR (W/kg)				Plot No.
					WiFi 1		WiFi 1				
					Tune-up Limit	Measured	Measured		Scaled		
							1-g	10-g	1-g	10-g	
GFSK	Rear	0	39	2441	12.0	11.8	0.019	0.008	0.020	0.008	
	Edge 3	0	39	2441	12.0	11.8	0.312	0.101	0.324	0.105	6
	Edge 4	0	39	2441	12.0	11.8	0.050	0.024	0.052	0.025	

Variant 2

Mode	Test Position	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		SAR (W/kg)				Plot No.
					WiFi 1		WiFi 1				
					Tune-up Limit	Measured	Measured		Scaled		
							1-g	10-g	1-g	10-g	
GFSK	Edge 3	0	39	2441	12.0	11.8	0.312	0.100	0.324	0.104	

12. SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

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

12.1. The Highest Measured SAR Configuration in Each Frequency Band

Frequency Band (MHz)	Air Interface	Body (W/kg)
2400	WiFi 802.11b/g/n	1.180
	Bluetooth	N/A
5200	WiFi 802.11a/n	0.891
5300	WiFi 802.11a/n	0.878
5500	WiFi 802.11a/n	1.050
5800	WiFi 802.11a/n	1.120

12.2. Repeated Measurement Results

Band	Test Position	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	1-g SAR (W/kg) Original		1-g SAR (W/kg) Repeated		Largest to Smallest SAR Ratio		Note
						WiFi 1	WiFi 2	WiFi 1	WiFi 2	WiFi 1	WiFi 2	
2.4GHz	Edge 3	802.11b	1 Tx	6	2437		1.180		1.160		1.02	1
5.2GHz	Edge 3	802.11a CDD	2 Tx	48	5240	0.676	0.891	0.675	0.858	1.00	1.04	1
5.3GHz	Edge 3	802.11a CDD	2 Tx	52	5260	0.760	0.878	0.717	0.870	1.06	1.01	1
5.5GHz	Edge 3	802.11a CDD	2 Tx	124	5620	0.581	1.050	0.554	1.030	1.05	1.02	1
5.8GHz	Edge 3	802.11a CDD	2 Tx	165	5825	0.851	1.120	0.851	1.120	1.00	1.00	1

Note(s):

1. Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20.

13. Simultaneous Transmission SAR Analysis

KDB 447498 D01 General RF Exposure Guidance introduces a new formula for calculating the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas:

$$SPLSR = (SAR_1 + SAR_2)^{1.5} / Ri$$

Where:

SAR_1 is the highest measured or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

SAR_2 is the highest measured or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first

Ri is the separation distance between the pair of simultaneous transmitting antennas. When the SAR is measured, for both antennas in the pair, it is determined by the actual x, y and z coordinates in the 1-g SAR for each SAR peak location, based on the extrapolated and interpolated result in the zoom scan measurement, using the formula of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$

A new threshold of 0.04 is also introduced in the draft KDB. Thus, in order for a pair of simultaneous transmitting antennas with the sum of 1-g SAR > 1.6 W/kg to qualify for exemption from Simultaneous Transmission SAR measurements, it has to satisfy the condition of:

$$(SAR_1 + SAR_2)^{1.5} / Ri < 0.04$$

13.1. Estimated SAR for Simultaneous Transmission SAR Analysis

Considerations for SAR estimation

1. When standalone SAR test exclusion applies, standalone SAR must also be estimated to determine simultaneous transmission SAR test exclusion.
2. 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

13.1.1. Estimated SAR for WiFi and BT

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Wi-Fi 1 / Bluetooth																
Wi-Fi 1	Wi-Fi 2.4 GHz	2462	16.50	45	6.5	181.3	93.5	3.4	9.8		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	NA
Wi-Fi 1	Wi-Fi 5.2 GHz	5230	16.00	40	6.5	181.3	93.5	3.4	9.8		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	NA
Wi-Fi 1	Wi-Fi 5.3 GHz	5300	16.00	40	6.5	181.3	93.5	3.4	9.8		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	NA
Wi-Fi 1	Wi-Fi 5.5 GHz	5680	15.50	35	6.5	181.3	93.5	3.4	9.8		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	NA
Wi-Fi 1	Wi-Fi 5.8 GHz	5825	15.50	35	6.5	181.3	93.5	3.4	9.8		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	NA
Wi-Fi 1	Bluetooth	2402	12.00	16	6.5	181.3	93.5	3.4	9.8		-MEASURE-	0.400	0.400	-MEASURE-	0.331	NA
Wi-Fi 2																
Wi-Fi 2	Wi-Fi 2.4 GHz	2462	16.50	45	6.5	191.1	14.4	3.4	93.5		-MEASURE-	0.400	-MEASURE-	-MEASURE-	0.400	NA
Wi-Fi 2	Wi-Fi 5.2 GHz	5230	16.00	40	6.5	191.1	14.4	3.4	93.5		-MEASURE-	0.400	-MEASURE-	-MEASURE-	0.400	NA
Wi-Fi 2	Wi-Fi 5.3 GHz	5300	16.00	40	6.5	191.1	14.4	3.4	93.5		-MEASURE-	0.400	-MEASURE-	-MEASURE-	0.400	NA
Wi-Fi 2	Wi-Fi 5.5 GHz	5680	15.50	35	6.5	191.1	14.4	3.4	93.5		-MEASURE-	0.400	-MEASURE-	-MEASURE-	0.400	NA
Wi-Fi 2	Wi-Fi 5.8 GHz	5825	15.50	35	6.5	191.1	14.4	3.4	93.5		-MEASURE-	0.400	-MEASURE-	-MEASURE-	0.400	NA

Use of WiFi estimated SAR in simultaneous transmission SAR analysis

- Edge 2 for Bluetooth: The estimated SAR value of **0.400** W/kg was used in Simultaneous Transmission Analysis, and distinguished from measured SAR values with green text.

13.2. Sum of the SAR for Wi-Fi 5GHz & BT

RF Exposure condition	Test Position	Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		UNII Band			Bluetooth (WiFi 1)		
		WiFi 1	WiFi 2	WiFi 1 + WiFi 2			
Body	Rear	0.053			0.020	0.073	No
			0.100		0.020	0.120	No
				0.124	0.020	0.144	No
	Edge 2		0.042		0.400	0.442	No
				0.152	0.400	0.552	No
	Edge 3	0.714			0.324	1.038	No
			1.050		0.324	1.374	No
				1.167	0.324	**1.491**	No
	Edge 4	0.085			0.052	0.137	No
				0.093	0.052	0.145	No

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

14. Appendixes

Refer to separated files for the following appendixes.

14.1. Photos

14.2. System Check Plots

14.3. Highest SAR Test Plots

14.4. Calibration Certificate for E-Field Probe EX3DV4 - SN 3885

14.5. Calibration Certificate for E-Field Probe EX3DV4 - SN 3749

14.6. Calibration Certificate for E-Field Probe EX3DV4 - SN 3901

14.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3989

14.8. Calibration Certificate for D2450V2 - SN 706

14.9. Calibration Certificate for D5GHzV2 - SN 1003

14.10. Calibration Certificate for D5GHzV2 - SN 1168

14.11. Tissue Material Ingredients

END OF REPORT