



SAR EVALUATION REPORT

**FCC 47 CFR § 2.1093
IEEE Std 1528-2013**

For
Portable Computer

**Model Name: A1534
FCC ID: BCGA1534**

**Report Number: 14U18574-S1A
Issue Date: 02/11/2015**

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

Prepared by
**UL Verification Services Inc.
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888**



NVLAP LAB CODE 200065-0

REVISION HISTORY

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--	01/27/2015	Initial Issue	--
A	02/11/2015	Revised based on the Reviewer's comment 1. Sec. 2: Revised KDB 690783D01 to v01r03. 2. Sec. 6.1: Updated table. 3. Sec. nos. 6.5 and 8.3: Updated table. 4. Appendix A: Added labeling to Device setup Photo.	Hung Thai

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1. Attestation of Test Results

Applicant Name		APPLE INC			
FCC ID		BCGA1534			
Model Name		A1534			
Applicable Standards		FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013			
SAR Limits (W/Kg)					
Exposure Category		Peak spatial-average (1g of tissue)			
General population/Uncontrolled exposure		1.6			
The Highest Reported SAR (W/kg)					
RF Exposure Conditions		Equipment Class			
		Licensed	DTS	U-NII	DSS (BT)
Standalone		N/A	0.888	0.984	0.157
Simultaneous Transmission	Body	N/A	N/A	1.141	N/A
Date Tested		11/12/2014 – 12/05/2014			
Test Results		Pass			
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.			Hung Thai Laboratory Technician 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 IEEE 802 11 transmitters DR01-41733I
- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- 865664 D02 SAR Reporting v01r01
- 690783 D01 SAR Listings on Grants v01r03

3. Facilities and Accreditation

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

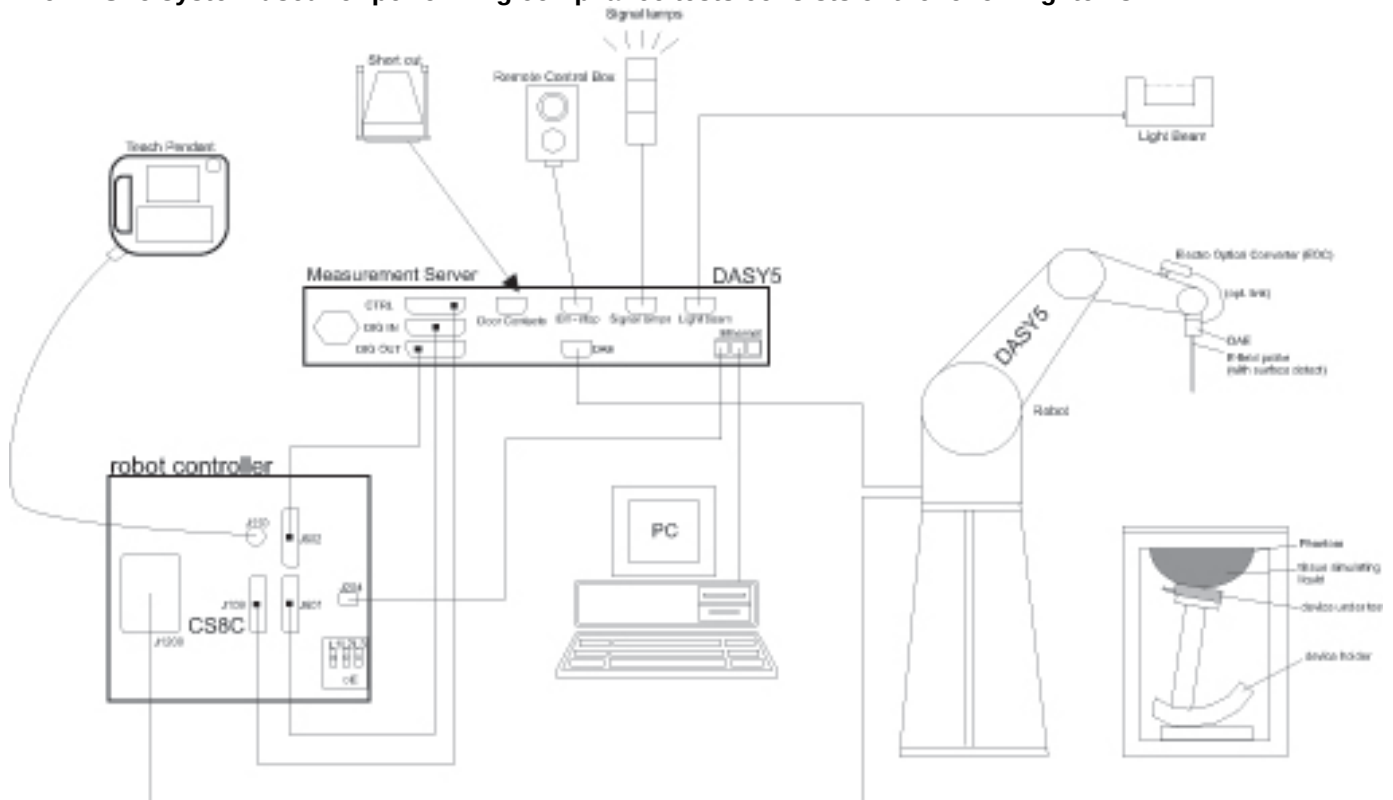
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

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	8753ES	MY40001647	7/17/2015
Dielectronic Probe kit	SPEAG	DAK-3.5	1103	2/18/2015
Dielectronic Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	Cole-Parmer Instrument Co.	91100-50	1007	7/31/2015

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	MY53040016	5/5/2015
Power Sensor	Agilent	E9323A	MY53070005	5/1/2015
Power Sensor	Agilent	E9323A	MY53070009	5/28/2015
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	MY53040016	5/15/2015
Power Sensor	Agilent	E9323A	MY53070009	5/28/2015
Power Sensor	Agilent	E9323A	MY53070005	5/1/2015
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	9/15/2015
E-Field Probe	SPEAG	EX3DV4	3989	4/15/2015
Data Acquisition Electronics	SPEAG	DAE4	1360	3/17/2015
Data Acquisition Electronics	SPEAG	DAE4	1433	4/14/2015
System Validation Dipole	SPEAG	D2450V2	899	9/10/2015
System Validation Dipole	SPEAG	D5GHzV2	1138	9/18/2015

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	Agilent	N1912A	MY50001018	9/3/2015
Power Sensor	Agilent	E9323A	MY53070002	3/6/2015
Power Sensor	Agilent	E9323A	US40411556	8/27/2015

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

Operating Configuration(s)	Portable Computer
Antennas Tested	<u>Part Number</u> Wi-Fi 1 & Bluetooth: eVT-110-AM CTH4414005XG3VR6E (for Chain 1) Wi-Fi 2 eVT-110-AM CTH4414005XG3VR6E (for Chain 2)

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20) 802.11ac (HT20)	100%
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (HT20) 802.11ac (HT40) 802.11ac (VHT80)	100%
Bluetooth	2.4 GHz	Version 2.1 BLE	100% (DH5)

6.3. Possible Combinations of 802.11 Modes vs. Tx Diversity Configurations

Band	802.11 Modes	Tx diversity configurations	Original Approval
2.4GHz (DSSS/OFDM)	11b	1 Tx	√
		2 Tx CDD	√
	11g	1 Tx	√
		2 Tx All None TXBF	√
		2 Tx (TXBF)	√
	11n	HT20 1 Tx	√
		HT20 2 Tx All None TXBF	√
		HT20 2 Tx (TXBF)	√
		HT40	disabled
	11ac	VHT20 (1 Tx)	√
		VHT40 (1 Tx)	disabled
		VHT80 (1 Tx)	disabled
		VHT20 None TXBF (2 Tx)	√
		VHT40 All/TXBF (2 Tx)	disabled
VHT80 All/TXBF (2 Tx)		disabled	

Note(s):			
The 11n/ac 2Tx VHT20/VHT40/VHT80 "All" modes detailed apply to all of CDD/STBC/SDM modes.			

Possible Combinations of 802.11 Modes vs. Tx Diversity Configurations (2Tx) - Continued

Band	802.11 Modes	Tx diversity configurations	Original Approval
5.2GHz (OFDM) UNII-1	11a	1 Tx	√
		2 Tx CDD	√
	11n	HT20 (1 Tx)	√
		HT40 (1 Tx)	√
		HT20 CDD (2 Tx)	√
		HT20 All None TXBF (2 Tx)	√
		HT20 TXBF (2 Tx)	√
		HT40 CDD (2 Tx)	√
		HT40 All None TXBF (2 Tx)	√
		HT40 TXBF (2 Tx)	√
	11ac	VHT20 SISO (1 Tx)	√
		VHT40 SISO (1 Tx)	√
		VHT80 SISO (1 Tx)	√
		VHT20 All None TXBF	√
		(2 Tx)	√
		VHT20 TXBF (2 Tx)	√
		VHT40 All None TXBF	√
		(2 Tx)	√
		VHT40 TXBF (2 Tx)	√
		VHT80 All None TXBF	√
		(2 Tx)	√
		VHT80 TXBF (2 Tx)	√

Note(s):

The 11n/ac 2Tx VHT20/VHT40/VHT80 "All" modes detailed apply to all of CDD/STBC/SDM modes.

Possible Combinations of 802.11 Modes vs. Tx Diversity Configurations (2Tx) - Continued

Band	802.11 Modes	Tx diversity configurations	Original Approval
5.3GHz (OFDM) UNII-2A	11a	1 Tx	√
		2 Tx CDD	√
	11n	HT20 (1 Tx)	√
		HT40 (1 Tx)	√
		HT20 All None TXBF (2 Tx)	√
		HT20 TXBF (2 Tx)	√
		HT40 All None TXBF (2 Tx)	√
		HT40 TXBF (2 Tx)	√
		11ac	VHT20 (1 Tx)
	VHT40 (1 Tx)		√
	VHT80 (1 Tx)		√
	VHT20 All None TXBF		√
	(2 Tx)		√
	VHT20 TXBF (2 Tx)		√
	VHT40 All None TXBF		√
	(2 Tx)		√
	VHT40 TXBF (2 Tx)		√
	VHT80 All None TXBF		√
	(2 Tx)		√
	VHT80 TXBF (2 Tx)	√	
Note(s):			
The 11n/ac 2Tx VHT20/VHT40/VHT80 "All" modes detailed apply to all of CDD/STBC/SDM modes.			

Possible Combinations of 802.11 Modes vs. Tx Diversity Configurations (2Tx) - Continued

Band	802.11 Modes	Tx diversity configurations	Original Approval
5.5GHz (OFDM) UNII-2C	11a	1 Tx	√
		2 Tx CDD	√
	11n	HT20 (1 Tx)	√
		HT40 (1 Tx)	√
		HT20 All None TXBF(2 Tx)	√
		HT20 TXBF (2 Tx)	√
		HT40 All None TXBF (2 Tx)	√
		HT40 TXBF (2 Tx)	√
		11ac	VHT20 (1 Tx)
	VHT40 (1 Tx)		√
	VHT80 (1 Tx)		√
	VHT20 All None TXBF		√
	(2 Tx)		√
	VHT20 TXBF (2 Tx)		√
	VHT40 All None TFBF		√
	(2 Tx)		√
	VHT40 TXBF (2 Tx)		√
	VHT80 All None TXBF		√
	(2 Tx)		√
	VHT80 TXBF (2 Tx)	√	
Note(s):			
The 11n/ac 2Tx VHT20/VHT40/VHT80 "All" modes detailed apply to all of CDD/STBC/SDM modes.			

Possible Combinations of 802.11 Modes vs. Tx Diversity Configurations (2Tx) - Continued

Band	802.11 Modes	Tx diversity configurations	Original Approval
5.8GHz (OFDM) UNII-3	11a	1 Tx	√
		2 Tx CDD	√
	11n	HT20 (1 Tx)	√
		HT40 (1 Tx)	√
		HT20 All None TXBF (2 Tx)	√
		HT20 TXBF (2 Tx)	√
		HT40 All None TXBF (2 Tx)	√
		HT40 TXBF (2 Tx)	√
		11ac	VHT20 (1 Tx)
	VHT40 (1 Tx)		√
	VHT80 (1 Tx)		√
	VHT20 All None TXBF		√
	(2 Tx)		√
	VHT20 TXBF (2 Tx)		√
	VHT40 All None TXBF		√
	(2 Tx)		√
	VHT40 TXBF (2 Tx)		√
	VHT80 All None TXBF		√
	(2 Tx)		√
	VHT80 TXBF (2 Tx)	√	
Note(s):			
The 11n/ac 2Tx VHT20/VHT40/VHT80 "All" modes detailed apply to all of CDD/STBC/SDM modes.			

6.4. Maximum Output Power

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
2.4 (DSSS)	802.11b Legacy	1 Tx	1	2412	19.5	
			2	2417	19.5	
			6	2437	19.5	
			10	2457	19.5	
			11	2462	19.5	
			12	2467	17.5	
			13	2472	15.0	
			1	2412		19.5
			2	2417		19.5
			6	2437		19.5
			10	2457		19.5
			11	2462		19.5
			12	2467		17.5
			13	2472		15.0
		2 Tx CDD	1	2412	19.5	19.5
			2	2417	19.5	19.5
			6	2437	19.5	19.5
			10	2457	19.5	19.5
			11	2462	18.0	18.0
			12	2467	15.5	15.5
			13	2472	13.0	13.0
2.4 (OFDM)	802.11g	1 Tx	1	2412	15.5	
			2	2417	17.5	
			3	2422	19.0	
			6	2437	19.0	
			9	2452	19.0	
			10	2457	18.0	
			11	2462	17.0	
			12	2467	14.0	
			13	2472	5.0	
			1	2412		15.5
			2	2417		17.5
			3	2422		19.0
			6	2437		19.0
			9	2452		19.0
			10	2457		18.0
			11	2462		17.0
			12	2467		14.0
			13	2472		5.0
	802.11g	2 Tx CDD	1	2412	13.5	13.5
			2	2417	16.5	16.5
			3	2422	19.0	19.0
			6	2437	19.0	19.0
			9	2452	19.0	19.0
			10	2457	17.0	17.0
			11	2462	12.0	12.0
			12	2467	9.0	9.0
			13	2472	0.0	0.0

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
2.4 (OFDM)	802.11g	2 Tx TXBF	1	2412	13.5	13.5
			2	2417	16.5	16.5
			3	2422	19.0	19.0
			6	2437	19.0	19.0
			9	2452	19.0	19.0
			10	2457	17.0	17.0
			11	2462	12.0	12.0
			12	2467	9.0	9.0
	802.11n	1 Tx HT20	1	2412	15.5	
			2	2422	17.5	
			3	2422	19.0	
			6	2437	19.0	
			9	2452	19.0	
			10	2457	18.0	
			11	2462	17.0	
			12	2467	14.0	
			1	2412		15.5
			2	2422		17.5
			3	2422		19.0
			6	2437		19.0
			9	2452		19.0
			10	2457		18.0
			11	2462		17.0
			12	2467		14.0
		2 Tx HT20 CDD	1	2412	13.5	13.5
			2	2422	16.5	16.5
			3	2422	19.0	19.0
			6	2437	19.0	19.0
			9	2452	19.0	19.0
			10	2457	17.0	17.0
			11	2462	12.0	12.0
			12	2467	9.0	9.0
		2 Tx HT20 All ² nonTXBF	1	2412	13.5	13.5
			2	2422	16.5	16.5
			3	2422	19.0	19.0
			6	2437	19.0	19.0
			9	2452	19.0	19.0
			10	2457	17.0	17.0
			11	2462	12.0	12.0
			12	2467	9.0	9.0
		2 Tx HT20 TXBF	1	2412	13.5	13.5
			2	2422	16.5	16.5
			3	2422	19.0	19.0
			6	2437	19.0	19.0
			9	2452	19.0	19.0
			10	2457	17.0	17.0
			11	2462	12.0	12.0
			12	2467	9.0	9.0

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target Power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
2.4	802.11ac	1 Tx VHT20	1	2412	15.5	
			2	2422	17.5	
			3	2422	19.0	
			6	2437	19.0	
			9	2452	19.0	
			10	2457	18.0	
			11	2462	17.0	
			12	2467	14.0	
			13	2472	5.0	
			1	2412		15.5
			2	2422		17.5
			3	2422		19.0
			6	2437		19.0
			9	2452		19.0
			10	2457		18.0
			11	2462		17.0
			12	2467		14.0
			13	2472		5.0
		2 Tx VHT20 CDD	1	2412	13.5	13.5
			2	2422	16.5	16.5
			3	2422	19.0	19.0
			6	2437	19.0	19.0
			9	2452	19.0	19.0
			10	2457	17.0	17.0
			11	2462	12.0	12.0
			12	2467	9.0	9.0
		2 Tx VHT20 All ² nonTXBF	1	2412	13.5	13.5
			2	2422	16.5	16.5
			3	2422	19.0	19.0
			6	2437	19.0	19.0
			9	2452	19.0	19.0
			10	2457	17.0	17.0
			11	2462	12.0	12.0
			12	2467	9.0	9.0
		2 Tx VHT20 TXBF	1	2412	13.5	13.5
			2	2422	16.5	16.5
			3	2422	19.0	19.0
			6	2437	19.0	19.0
			9	2452	19.0	19.0
			10	2457	17.0	17.0
			11	2462	12.0	12.0
			12	2467	9.0	9.0

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
5.2 (OFDM) U-NII-1	802.11a	1 Tx	36	5180	16.5	
			40	5200	18.0	
			44	5220	18.0	
			48	5240	18.0	
			36	5180		16.5
			40	5200		18.0
			44	5220		18.0
			48	5240		18.0
	802.11a	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	16.5	
			40	5200	18.0	
			44	5220	18.0	
			48	5240	18.0	
			36	5180		16.5
			40	5200		18.0
			44	5220		18.0
			48	5240		18.0
		1 Tx HT40	38	5190	14.5	
			46	5230	18.0	
			38	5190		14.5
			46	5230		18.0
		2 Tx HT20 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
		2 Tx HT20 STBC	36	5180	16.0	16.0
			40	5200	17.0	17.0
			44	5220	17.0	17.0
			48	5240	17.0	17.0
		2 Tx HT20 SDM	36	5180	16.0	16.0
			40	5200	17.0	17.0
			44	5220	17.0	17.0
			48	5240	17.0	17.0
		2 Tx HT20 TXBF	36	5180	16.0	16.0
			40	5200	16.0	16.0
			44	5220	16.0	16.0
			48	5240	16.0	16.0

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
5.2 (OFDM) U-NII-1	802.11n	2 Tx HT40 CDD	38	5190	14.0	14.0
			46	5230	18.0	18.0
		2 Tx HT40 STBC	38	5190	14.0	14.0
			46	5230	18.0	18.0
		2 Tx HT40 SDM	38	5190	14.0	14.0
			46	5230	18.0	18.0
		2 Tx HT40 TXBF	38	5190	14.0	14.0
			46	5230	18.0	18.0
	802.11ac	1 Tx VHT20	36	5180	16.5	
			40	5200	18.0	
			44	5220	18.0	
			48	5240	18.0	
			36	5180		16.5
			40	5200		18.0
			44	5220		18.0
			48	5240		18.0
		1 Tx VHT40	38	5190	14.5	
			46	5230	18.0	
			38	5190		14.5
			46	5230		18.0
		1 Tx VHT80	42	5210	13.0	
			42	5210		13.0
		2 Tx VHT20 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
		2 Tx VHT20 STBC	36	5180	16.0	16.0
			40	5200	17.0	17.0
			44	5220	17.0	17.0
			48	5240	17.0	17.0
		2 Tx VHT20 SDM	36	5180	16.0	16.0
			40	5200	17.0	17.0
			44	5220	17.0	17.0
			48	5240	17.0	17.0
		2 Tx VHT20 TXBF	36	5180	16.0	16.0
			40	5200	16.0	16.0
			44	5220	16.0	16.0
			48	5240	16.0	16.0

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
5.2 (OFDM) U-NII-1	802.11ac	2 Tx VHT40 CDD	38	5190	14.0	14.0
			46	5230	18.0	18.0
		2 Tx VHT40 STBC	38	5190	14.0	14.0
			46	5230	18.0	18.0
		2 Tx VHT40 SDM	38	5190	14.0	14.0
			46	5230	18.0	18.0
		2 Tx VHT40 TXBF	38	5190	14.0	14.0
			46	5230	18.0	18.0
		2 Tx VHT80 CDD	42	5210	12.0	12.0
		2 Tx VHT80 STBC	42	5210	12.0	12.0
		2 Tx VHT80 SDM	42	5210	12.0	12.0
		2 Tx VHT80 TXBF	42	5210	12.0	12.0

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
5.3 (OFDM) U-NII-2A	802.11a	1 Tx	52	5260	18.0	
			56	5280	18.0	
			60	5300	18.0	
			64	5320	17.5	
			52	5260		18.0
			56	5280		18.0
			60	5300		18.0
			64	5320		17.5
		2 Tx CDD	52	5260	16.0	16.0
			56	5280	16.0	16.0
			60	5300	16.0	16.0
			64	5320	16.0	16.0
	802.11n	1 Tx HT20	52	5260	18.0	
			56	5280	18.0	
			60	5300	18.0	
			64	5320	17.5	
			52	5260		18.0
			56	5280		18.0
			60	5300		18.0
			64	5320		17.5
		1 Tx HT40	54	5270	18.0	
			62	5310	14.5	
			54	5270		18.0
			62	5310		14.5
		2 Tx HT20 CDD	52	5260	16.0	16.0
			56	5280	16.0	16.0
			60	5300	16.0	16.0
			64	5320	16.0	16.0
		2 Tx HT20 STBC	52	5260	17.0	17.0
			56	5280	17.0	17.0
			60	5300	17.0	17.0
			64	5320	16.5	16.5
		2 Tx HT20 SDM	52	5260	17.0	17.0
			56	5280	17.0	17.0
			60	5300	17.0	17.0
			64	5320	16.5	16.5
		2 Tx HT20 TXBF	52	5260	16.0	16.0
			56	5280	16.0	16.0
			60	5300	16.0	16.0
			64	5320	16.0	16.0

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
5.3 (OFDM) U-NII-2A	802.11n	2 Tx HT40 CDD	54	5270	18.0	18.0
			62	5310	13.0	13.0
		2 Tx HT40 STBC	54	5270	18.0	18.0
			62	5310	13.0	13.0
		2 Tx HT40 SDM	54	5270	18.0	18.0
			62	5310	13.0	13.0
		2 Tx HT40 TXBF	54	5270	18.0	18.0
			62	5310	13.0	13.0
	802.11ac	1 Tx VHT20	52	5260	18.0	
			56	5280	18.0	
			60	5300	18.0	
			64	5320	17.5	
			52	5260		18.0
			56	5280		18.0
			60	5300		18.0
			64	5320		17.5
		1 Tx VHT40	54	5270	18.0	
			62	5310	14.5	
			54	5270		18.0
			62	5310		14.5
		1 Tx VHT80	58	5290	12.0	
			58	5290		12.0

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
5.3 (OFDM) U-NII-2A	802.11ac	2 Tx VHT20 CDD	52	5260	16.0	16.0
			56	5280	16.0	16.0
			60	5300	16.0	16.0
			64	5320	16.0	16.0
		2 Tx VHT20 STBC	52	5260	17.0	17.0
			56	5280	17.0	17.0
			60	5300	17.0	17.0
			64	5320	16.5	16.5
		2 Tx VHT20 SDM	52	5260	17.0	17.0
			56	5280	17.0	17.0
			60	5300	17.0	17.0
			64	5320	16.5	16.5
		2 Tx VHT20 TXBF	52	5260	16.0	16.0
			56	5280	16.0	16.0
			60	5300	16.0	16.0
			64	5320	16.0	16.0
		2 Tx VHT40 CDD	54	5270	18.0	18.0
			62	5310	13.0	13.0
		2 Tx VHT40 STBC	54	5270	18.0	18.0
			62	5310	13.0	13.0
		2 Tx VHT40 SDM	54	5270	18.0	18.0
			62	5310	13.0	13.0
		2 Tx VHT40 TXBF	54	5270	18.0	18.0
			62	5310	13.0	13.0
		2 Tx VHT80 CDD	58	5290	9.5	9.5
		2 Tx VHT80 STBC	58	5290	9.5	9.5
		2 Tx VHT80 SDM	58	5290	9.5	9.5
		2 Tx VHT80 TXBF	58	5290	9.5	9.5

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
5.5 (OFDM) U-NII-2C	802.11a	1 Tx	100	5500	18.0	
			104	5520	18.0	
			108	5540	18.0	
			112	5560	18.0	
			116	5580	18.0	
			120	5600	18.0	
			124	5620	18.0	
			128	5640	18.0	
			100	5500		18.0
			104	5520		18.0
			108	5540		18.0
			112	5560		18.0
			116	5580		18.0
			120	5600		18.0
			124	5620		18.0
			128	5640		18.0
		2 Tx CDD	100	5500	14.5	14.5
			104	5520	14.5	14.5
			108	5540	14.5	14.5
			112	5560	14.5	14.5
			116	5580	14.5	14.5
			120	5600	14.5	14.5
			124	5620	14.5	14.5
			128	5640	14.5	14.5
	802.11n	1 Tx HT20	100	5500	18.0	
			104	5520	18.0	
			108	5540	18.0	
			112	5560	18.0	
			116	5580	18.0	
			120	5600	18.0	
			124	5620	18.0	
			128	5640	18.0	
			100	5500		18.0
			104	5520		18.0
			108	5540		18.0
			112	5560		18.0
			116	5580		18.0
			120	5600		18.0
			124	5620		18.0
			128	5640		18.0

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
5.5 (OFDM) U-NII-2C	802.11n	1 Tx HT40	102	5510	16.0	
			110	5550	18.0	
			118	5590	18.0	
			126	5630	18.0	
			102	5510		16.0
			110	5550		18.0
			118	5590		18.0
			126	5630		18.0
		2 Tx HT20 CDD	100	5500	14.5	14.5
			104	5520	14.5	14.5
			108	5540	14.5	14.5
			112	5560	14.5	14.5
			116	5580	14.5	14.5
			120	5600	14.5	14.5
			124	5620	14.5	14.5
			128	5640	14.5	14.5
		2 Tx HT20 STBC	100	5500	17.0	17.0
			104	5520	17.0	17.0
			108	5540	17.0	17.0
			112	5560	17.0	17.0
			116	5580	17.0	17.0
			120	5600	17.0	17.0
			124	5620	17.0	17.0
			128	5640	17.0	17.0
		2 Tx HT20 SDM	100	5500	17.0	17.0
			104	5520	17.0	17.0
			108	5540	17.0	17.0
			112	5560	17.0	17.0
			116	5580	17.0	17.0
			120	5600	17.0	17.0
			124	5620	17.0	17.0
			128	5640	17.0	17.0
		2 Tx HT20 TXBF	100	5500	14.5	14.5
			104	5520	14.5	14.5
			108	5540	14.5	14.5
			112	5560	14.5	14.5
			116	5580	14.5	14.5
			120	5600	14.5	14.5
			124	5620	14.5	14.5
			128	5640	14.5	14.5

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
5.5 (OFDM) U-NII-2C	802.11n	2 Tx HT40 CDD	102	5510	13.0	13.0
			110	5550	17.0	17.0
			118	5590	17.0	17.0
			126	5630	17.0	17.0
		2 Tx HT40 STBC	102	5510	13.0	13.0
			110	5550	18.0	18.0
			118	5590	18.0	18.0
			126	5630	18.0	18.0
		2 Tx HT40 SDM	102	5510	13.0	13.0
			110	5550	18.0	18.0
			118	5590	18.0	18.0
			126	5630	18.0	18.0
		2 Tx HT40 TXBF	102	5510	13.0	13.0
			110	5550	17.0	17.0
			118	5590	17.0	17.0
			126	5630	17.0	17.0
	802.11ac	1 Tx VHT20	100	5500	18.0	
			104	5520	18.0	
			108	5540	18.0	
			112	5560	18.0	
			116	5580	18.0	
			120	5600	18.0	
			124	5620	18.0	
			128	5640	18.0	
			100	5500		18.0
			104	5520		18.0
			108	5540		18.0
			112	5560		18.0
			116	5580		18.0
			120	5600		18.0
			124	5620		18.0
			128	5640		18.0

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
5.5 (OFDM) U-NII-2C	802.11ac	1 Tx VHT40	102	5510	16.0	
			110	5550	18.0	
			118	5590	18.0	
			126	5630	18.0	
			102	5510		16.0
			110	5550		18.0
			118	5590		18.0
			126	5630		18.0
		1 Tx VHT80	106	5530	12.0	
			122	5610	18.0	
			138	5690	18.0	
			106	5530		12.0
			122	5610		18.0
			138	5690		18.0
		1 Tx VHT80	106	5530	12.0	
			122	5610	18.0	
			106	5530		12.0
			122	5610		18.0
		2 Tx VHT20 CDD	100	5500	14.5	14.5
			104	5520	14.5	14.5
			108	5540	14.5	14.5
			112	5560	14.5	14.5
			116	5580	14.5	14.5
			120	5600	14.5	14.5
			124	5620	14.5	14.5
			128	5640	14.5	14.5
		2 Tx VHT20 STBC	100	5500	17.0	17.0
			104	5520	17.0	17.0
			108	5540	17.0	17.0
			112	5560	17.0	17.0
			116	5580	17.0	17.0
			120	5600	17.0	17.0
			124	5620	17.0	17.0
			128	5640	17.0	17.0

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
5.5 (OFDM) U-NII-2C	802.11ac	2 Tx VHT20 SDM	100	5500	17.0	17.0
			104	5520	17.0	17.0
			108	5540	17.0	17.0
			112	5560	17.0	17.0
			116	5580	17.0	17.0
			120	5600	17.0	17.0
			124	5620	17.0	17.0
			128	5640	17.0	17.0
		2 Tx VHT20 TXBF	100	5500	14.5	14.5
			104	5520	14.5	14.5
			108	5540	14.5	14.5
			112	5560	14.5	14.5
			116	5580	14.5	14.5
			120	5600	14.5	14.5
			124	5620	14.5	14.5
			128	5640	14.5	14.5
		2 Tx VHT40 CDD	102	5510	13.0	13.0
			110	5550	17.0	17.0
			118	5590	17.0	17.0
			126	5630	17.0	17.0
		2 Tx VHT40 STBC	102	5510	13.0	13.0
			110	5550	18.0	18.0
			118	5590	18.0	18.0
			126	5630	18.0	18.0
		2 Tx VHT40 SDM	102	5510	13.0	13.0
			110	5550	18.0	18.0
			118	5590	18.0	18.0
			126	5630	18.0	18.0
		2 Tx VHT40 TXBF	102	5510	13.0	13.0
			110	5550	17.0	17.0
			118	5590	17.0	17.0
			126	5630	17.0	17.0
		2 Tx VHT80 CDD	106	5530	11.0	11.0
			122	5610	18.0	18.0
		2 Tx VHT80 STBC	106	5530	11.0	11.0
			122	5610	18.0	18.0
		2 Tx VHT80 SDM	106	5530	11.0	11.0
			122	5610	18.0	18.0
		2 Tx VHT80 TXBF	106	5530	11.0	11.0
			122	5610	17.0	17.0

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
5.8 (OFDM) U-NII-3	802.11a	1 Tx	132	5660	18.0	
			136	5680	18.0	
			140	5700	17.5	
			144	5720	17.5	
			149	5745	18.0	
			153	5765	18.0	
			157	5785	18.0	
			161	5805	18.0	
			165	5825	18.0	
			132	5660		18.0
			136	5680		18.0
			140	5700		17.5
			144	5720		17.5
			149	5745		18.0
			153	5765		18.0
			157	5785		18.0
			161	5805		18.0
			165	5825		18.0
		2 Tx CDD	132	5660	14.5	14.5
			136	5680	14.5	14.5
			140	5700	14.5	14.5
			144	5720	14.5	14.5
			149	5745	16.5	16.5
			153	5765	18.0	18.0
			157	5785	18.0	18.0
			161	5805	18.0	18.0
			165	5825	17.0	17.0
	802.11n	1 Tx HT20	149	5745	18.0	
			153	5765	18.0	
			157	5785	17.5	
			161	5805	17.5	
			149	5745	18.0	
			153	5765	18.0	
			157	5785	18.0	
			161	5805	18.0	
			165	5825	18.0	
			149	5745		18.0
			153	5765		18.0
			157	5785		17.5
			161	5805		17.5
			149	5745		18.0
			153	5765		18.0
			157	5785		18.0
			161	5805		18.0
			165	5825		18.0

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
5.8 (OFDM) U-NII-3	802.11n	1 Tx HT40	134	5670	18.0	
			142	5710	18.0	
			151	5755	16.5	
			159	5795	18.0	
			134	5670		18.0
			142	5710		18.0
			151	5755		16.5
			159	5795		18.0
		2 Tx HT20 CDD	132	5660	14.5	14.5
			136	5680	14.5	14.5
			140	5700	14.5	14.5
			144	5720	14.5	14.5
			149	5745	16.5	16.5
			153	5765	18.0	18.0
			157	5785	18.0	18.0
			161	5805	18.0	18.0
			165	5825	17.0	17.0
		2 Tx HT20 STBC	132	5660	17.0	17.0
			136	5680	17.0	17.0
			140	5700	16.5	16.5
			144	5720	16.5	16.5
			149	5745	16.5	16.5
			153	5765	18.0	18.0
			157	5785	18.0	18.0
			161	5805	18.0	18.0
			165	5825	17.0	17.0
		2 Tx HT20 SDM	132	5660	17.0	17.0
			136	5680	17.0	17.0
			140	5700	16.5	16.5
			144	5720	16.5	16.5
			149	5745	16.5	16.5
			153	5765	18.0	18.0
			157	5785	18.0	18.0
			161	5805	18.0	18.0
			165	5825	17.0	17.0
		2 Tx HT20 TXBF	132	5660	14.5	14.5
			136	5680	14.5	14.5
			140	5700	14.5	14.5
			144	5720	14.5	14.5
			149	5745	16.5	16.5
			153	5765	18.0	18.0
			157	5785	18.0	18.0
			161	5805	18.0	18.0
			165	5825	17.0	17.0

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
5.8 (OFDM) U-NII-3	802.11n	2 Tx HT40 CDD	134	5670	17.0	17.0
			142	5710	17.0	17.0
			151	5755	15.0	15.0
			159	5795	17.0	17.0
		2 Tx HT40 STBC	134	5670	17.0	17.0
			142	5710	17.0	17.0
			151	5755	15.0	15.0
			159	5795	17.0	17.0
		2 Tx HT40 SDM	134	5670	17.0	17.0
			142	5710	17.0	17.0
			151	5755	15.0	15.0
			159	5795	17.0	17.0
		2 Tx HT40 TXBF	134	5670	17.0	17.0
			142	5710	17.0	17.0
			151	5755	15.0	15.0
			159	5795	17.0	17.0
	802.11ac	1 Tx VHT20	132	5660	18.0	
			136	5680	18.0	
			140	5700	17.5	
			144	5720	17.5	
			149	5745	18.0	
			153	5765	18.0	
			157	5785	18.0	
			161	5805	18.0	
			165	5825	18.0	
			132	5660		18.0
			136	5680		18.0
			140	5700		17.5
			144	5720		17.5
			149	5745		18.0
			153	5765		18.0
			157	5785		18.0
			161	5805		18.0
			165	5825		18.0

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
5.8 (OFDM) U-NII-3	802.11ac	1 Tx VHT40	134	5670	18.0	
			142	5710	18.0	
			151	5755	16.5	
			159	5795	18.0	
			134	5670		18.0
			142	5710		18.0
			151	5755		16.5
			159	5795		18.0
		1 Tx VHT80	138	5690	18.0	
			155	5775	15.5	
			138	5690		18.0
			155	5775		15.5
		2 Tx VHT20 CDD	132	5660	14.5	14.5
			136	5680	14.5	14.5
			140	5700	14.5	14.5
			144	5720	14.5	14.5
			149	5745	16.5	16.5
			153	5765	18.0	18.0
			157	5785	18.0	18.0
			161	5805	18.0	18.0
			165	5825	17.0	17.0
		2 Tx VHT20 STBC	132	5660	17.0	17.0
			136	5680	17.0	17.0
			140	5700	16.5	16.5
			144	5720	16.5	16.5
			149	5745	16.5	16.5
			153	5765	18.0	18.0
			157	5785	18.0	18.0
			161	5805	18.0	18.0
			165	5825	17.0	17.0
		2 Tx VHT20 SDM	132	5660	17.0	17.0
			136	5680	17.0	17.0
			140	5700	16.5	16.5
			144	5720	16.5	16.5
			149	5745	16.5	16.5
			153	5765	18.0	18.0
			157	5785	18.0	18.0
			161	5805	18.0	18.0
			165	5825	17.0	17.0

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Maximum Target power (dBm)	
					WiFi 1	WiFi 2
					Chain 1	Chain 2
5.8 (OFDM) U-NII-3	802.11ac	2 Tx VHT20 TXBF	132	5660	14.5	14.5
			136	5680	14.5	14.5
			140	5700	14.5	14.5
			144	5720	14.5	14.5
			149	5745	16.5	16.5
			153	5765	18.0	18.0
			157	5785	18.0	18.0
			161	5805	18.0	18.0
			165	5825	17.0	17.0
		2 Tx VHT40 CDD	134	5670	17.0	17.0
			142	5710	17.0	17.0
			151	5755	15.0	15.0
			159	5795	17.0	17.0
		2 Tx VHT40 STBC	134	5670	17.0	17.0
			142	5710	17.0	17.0
			151	5755	15.0	15.0
			159	5795	17.0	17.0
		2 Tx VHT40 SDM	134	5670	17.0	17.0
			142	5710	17.0	17.0
			151	5755	15.0	15.0
			159	5795	17.0	17.0
		2 Tx VHT40 TXBF	134	5670	17.0	17.0
			142	5710	17.0	17.0
			151	5755	15.0	15.0
			159	5795	17.0	17.0
		2 Tx VHT80 CDD	138	5690	18.0	18.0
			155	5775	13.5	13.5
		2 Tx VHT80 STBC	138	5690	18.0	18.0
			155	5775	13.5	13.5
		2 Tx VHT80 SDM	138	5690	18.0	18.0
			155	5775	13.5	13.5
		2 Tx VHT80 TXBF	138	5690	17.0	17.0
			155	5775	13.5	13.5

6.5. Bluetooth Maximum Output Power

Band (GHz)	Mode	Ch #	Freq. (MHz)	Avg Power (dBm)
2.4	V2.1 + EDR, GFSK	0	2402	12.0
		39	2441	12.0
		78	2480	12.0
	V2.1 + EDR, QPSK	0	2402	10.0
		39	2441	10.0
		78	2480	10.0
	V2.1 BLE, 8-DPSK	0	2402	10.0
		19	2440	10.0
		39	2480	10.0

6.6. Simultaneous Transmission Condition

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

6.7. Antenna Dimensions and Separation Distances

Refer to separate filing document.

7. RF Exposure Conditions (Test Configurations)

Wireless technologies	RF Exposure Conditions	DUT-to-User Separation	Test Position	Antenna-to-edge/surface	SAR Required	Note
WLAN	Body	0.64 mm	Rear	N/A	Yes	

8. RF Output Power Measurement

8.1. WiFi (2.4 GHz Band)

Output Power Measurement Considerations for Wi-Fi 2.4 GHz band

1. 2.4 GHz 802.11b DSSS:
 - Output power measurement is not required:
 - o When SAR Test Exclusion according to KDB 447498 D01 applies.
 - o When other power measurement reduction applies.
 - Otherwise, output power measurement is required on:
 - o Channels 1, 6, and 11, when the output power specified for other channels is no higher than the abovementioned channels.
 - o The closest adjacent channels to the aforementioned channels, when the output power specified for these adjacent channels is higher.
 - For ease of identification, 802.11b DSSS is identified as the Initial Test Configuration for the 2.4 GHz band.
2. 2.4 GHz 802.11g/n OFDM
 - Output power measurement is not required:
 - o When SAR Test Exclusion according to KDB 447498 D01 applies.
 - o When SAR Test Exclusion procedures for 2.4 GHz 802.11g/n OFDM applies, according to the SAR measurement results from 802.11b DSSS; see Section 11 of the report for details.
 - Otherwise, output power measurement is required for 2.4 GHz 802.11g/n OFDM, with the following considerations:
 - o If 40 MHz bandwidth configurations are supported, measure power for either Channel 6 or the highest specified output power channel.
 - o Output power measurement requirements for smaller bandwidth configurations are dependent on the SAR measurement results from the 40 MHz bandwidth configurations.
 - o If no 40 MHz bandwidth configurations are supported, then a channel selection process similar to 802.11b DSSS is applied.
 - The output power measurement is required for 2.4 GHz 802.11g/n OFDM as a result of 802.11b DSSS reported SAR results, the required test configurations in 2.4 GHz 802.11g/n OFDM are identified as Subsequent Test Configurations with respect to the Initial Test Configuration status assigned to 802.11b DSSS.
 - If, for a particular antenna or transmit diversity condition supported by the device, no 802.11b DSSS configurations are available, output power should also be measured as a default for 802.11g/n OFDM when SAR Test Exclusion according to KDB 447498 D01 does not apply; these 802.11g/n OFDM configurations are considered the Initial Test Configurations for the respective antenna/transmit diversity condition.

WiFi 2.4 GHz Bands Measured Results

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
2.4 (DSSS)	802.11b Legacy	1 Tx	1	2412	19.5		Yes Initial Test Configuration
			2	2417	19.5		
			6	2437	19.5		
			10	2457	19.5		
			11	2462	19.5		
			12	2467	17.5		
			13	2472	15.0		
			1	2412		19.5	
			2	2417		19.5	
			6	2437		19.5	
			10	2457		19.5	
			11	2462		19.5	
			12	2467		17.5	
			13	2472		15.0	
		2 Tx CDD	1	2412	19.5	19.5	Yes Initial Test Configuration
			2	2417	19.5	19.5	
			3	2422	19.5	19.5	
			6	2437	19.5	19.5	
			9	2452	19.5	19.5	
			10	2457	19.5	19.5	
			11	2462	18.0	18.0	
			12	2467	15.5	15.5	
			13	2472	13.0	13.0	
2.4 (OFDM)	802.11g	1 Tx	1	2412	15.5		Yes Subsequent Test Configuration
			2	2417	17.5		
			3	2422	19.0		
			6	2437	19.0		
			9	2452	19.0		
			10	2457	18.0		
			11	2462	17.0		
			12	2467	14.0		
			13	2472	5.0		
			1	2412		15.5	
			2	2417		17.5	
			3	2422		19.0	
			6	2437		19.0	
			9	2452		19.0	
			10	2457		18.0	
			11	2462		17.0	
			12	2467		14.0	
			13	2472		5.0	

Wi-Fi 2.4 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
2.4 (OFDM)	802.11g	2 Tx CDD	1	2412	13.5	13.5	Yes Subsequent Test Configuration
			2	2417	16.5	16.5	
			3	2422	19.0	19.0	
			6	2437	19.0	19.0	
			9	2452	19.0	19.0	
			10	2457	17.0	17.0	
			11	2462	12.0	12.0	
			12	2467	9.0	9.0	
			13	2472	0.0	0.0	
	802.11g	2 Tx TXBF	1	2412	13.5	13.5	No
			2	2417	16.5	16.5	
			3	2422	19.0	19.0	
			6	2437	19.0	19.0	
			9	2452	19.0	19.0	
			10	2457	17.0	17.0	
			11	2462	12.0	12.0	
			12	2467	9.0	9.0	
			13	2472	0.0	0.0	
	802.11n	1 Tx HT20	1	2412	15.5		No
			2	2422	17.5		
			3	2422	19.0		
			6	2437	19.0		
			9	2452	19.0		
			10	2457	18.0		
			11	2462	17.0		
			12	2467	14.0		
			13	2472	5.0		
			1	2412		15.5	
			2	2422		17.5	
			3	2422		19.0	
			6	2437		19.0	
			9	2452		19.0	
			10	2457		18.0	
			11	2462		17.0	
			12	2467		14.0	
			13	2472		5.0	

Wi-Fi 2.4 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
2.4 (OFDM)	802.11n	2 Tx HT20 CDD	1	2412	13.5	13.5	No
			2	2422	16.5	16.5	
			3	2422	19.0	19.0	
			6	2437	19.0	19.0	
			9	2452	19.0	19.0	
			10	2457	17.0	17.0	
			11	2462	12.0	12.0	
			12	2467	9.0	9.0	
			13	2472	0.0	0.0	
		2 Tx HT20 All ² nonTXBF	1	2412	13.5	13.5	No
			2	2422	16.5	16.5	
			3	2422	19.0	19.0	
			6	2437	19.0	19.0	
			9	2452	19.0	19.0	
			10	2457	17.0	17.0	
			11	2462	12.0	12.0	
			12	2467	9.0	9.0	
			13	2472	0.0	0.0	
		2 Tx HT20 TXBF	1	2412	13.5	13.5	No
			2	2422	16.5	16.5	
			3	2422	19.0	19.0	
			6	2437	19.0	19.0	
			9	2452	19.0	19.0	
			10	2457	17.0	17.0	
			11	2462	12.0	12.0	
			12	2467	9.0	9.0	
			13	2472	0.0	0.0	
		2 Tx HT40 All ² /TXBF	40MHz Transmission disabled in the 2.4GHz Band				

Wi-Fi 2.4 GHz Band Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg. Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
2.4 (OFDM)	802.11ac	1 Tx VHT20	1	2412	15.5		Yes
			2	2422	17.5		
			3	2422	19.0		
			6	2437	19.0		
			9	2452	19.0		
			10	2457	18.0		
			11	2462	17.0		
			12	2467	14.0		
			13	2472	5.0		
			1	2412		15.5	
			2	2422		17.5	
			3	2422		19.0	
			6	2437		19.0	
			9	2452		19.0	
			10	2457		18.0	
			11	2462		17.0	
			12	2467		14.0	
			13	2472		5.0	
		2 Tx VHT20 CDD	1	2412	13.5	13.5	Yes
			2	2422	16.5	16.5	
			3	2422	19.0	19.0	
			6	2437	19.0	19.0	
			9	2452	19.0	19.0	
			10	2457	17.0	17.0	
			11	2462	12.0	12.0	
			12	2467	9.0	9.0	
		2 Tx VHT20 All ² nonTXBF	1	2412	13.5	13.5	No
			2	2422	16.5	16.5	
			3	2422	19.0	19.0	
			6	2437	19.0	19.0	
			9	2452	19.0	19.0	
			10	2457	17.0	17.0	
			11	2462	12.0	12.0	
			12	2467	9.0	9.0	
		2 Tx VHT20 TXBF	1	2412	13.5	13.5	No
			2	2422	16.5	16.5	
			3	2422	19.0	19.0	
			6	2437	19.0	19.0	
			9	2452	19.0	19.0	
			10	2457	17.0	17.0	
			11	2462	12.0	12.0	
			12	2467	9.0	9.0	
		2 Tx HT40 All ² /TXBF	40MHz Transmission disabled in the 2.4GHz Band				

8.2. WiFi (5 GHz Bands)

Output Power Measurement Considerations for Wi-Fi 5 GHz bands

1. Frequency Band and Test Channel Considerations

- 5.15 – 5.25 and 5.25 – 5.35 GHz Bands (UNII Band 1 and UNII Band 2A)
 - o When SAR Test Exclusion according to KDB 447498 D01 does not apply, output power measurement is initially required for:
 - UNII 2A, if the output power specified for both bands are identical or higher on UNII 2A.
 - UNII 1, if higher output power is specified for UNII 1.
 - o Power must be measured at the highest and lowest channels in the frequency band, and also the mid-band channel when there are at least 3 channels.
 - o Output power measurement requirements for the remaining band are dependent on the SAR measurement results from the band initially tested; see Section 11 of the report for details
- 5.470 – 5.725, 5.725 – 5.825 GHz and 5.725 – 5.850 GHz Bands (UNII Band 2C and UNII 3)
 - o If both bands are ineligible for SAR Test Exclusion according to KDB 447498 D01 and the band gap channels between the two bands are supported, the frequency channels in UNII Band 2C from 5.65 GHz and above must be considered with UNII 3 for the sake of SAR measurement accuracy.
 - o Taking into account the grouping of frequency channels described above, output power is then measured at the highest, lowest and mid-band (where applicable) channels accordingly.

2. Test Mode and Configuration Considerations

- Within a frequency band that requires output power measurements, the process of choosing an initial mode for measurement is as follows:
 - o The mode and bandwidth configuration with the highest specified output power is prioritized.
 - o If the output power specified is the same across all modes and bandwidth configurations, the mode with the highest bandwidth is chosen.
 - o If a test mode cannot be identified with the two criteria listed above, the mode with the lowest order modulation is chosen.
 - o If a test mode still cannot be decided, then the mode with the lowest data rate is chosen.
 - o The mode that is chosen from this process is identified as the Initial Test Configuration
- Output power measurement requirements for other modes are dependent on the SAR measurement results from the initial mode of measurement (see Section 11 of the report for details); if SAR measurement is required for a subsequent mode/configuration, the following should be considered:
 - o The same process in choosing the Initial Test Configuration is applied again to choose the next configuration; this is identified as the Subsequent Test Configuration.
 - o If the Subsequent Test Configuration is of lower bandwidth than the Initial Test Configuration, power should be measured on all channels that overlap with the channels in the Initial Test Configuration that incurred testing for the Subsequent Test Configurations.

WiFi 5 GHz Bands Measured Results

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
5.2 (OFDM) U-NII-1	802.11a	1 Tx	36	5180	16.5		No
			40	5200	18.0		
			44	5220	18.0		
			48	5240	18.0		
		2 Tx CDD	36	5180		16.5	No
			40	5200		18.0	
			44	5220		18.0	
			48	5240		18.0	
	802.11n	1 Tx HT20	36	5180	16.5		No
			40	5200	18.0		
			44	5220	18.0		
			48	5240	18.0		
		1 Tx HT40	36	5180		16.5	No
			40	5200		18.0	
			44	5220		18.0	
			48	5240		18.0	
		2 Tx HT20 CDD	38	5190	14.5		No
			46	5230	18.0		
			38	5190		14.5	
			46	5230		18.0	
		2 Tx HT20 STBC	36	5180	16.0	16.0	No
			40	5200	16.0	16.0	
			44	5220	16.0	16.0	
			48	5240	16.0	16.0	
		2 Tx HT20 SDM	36	5180	16.0	16.0	No
			40	5200	17.0	17.0	
			44	5220	17.0	17.0	
			48	5240	17.0	17.0	
		2 Tx HT20 TXBF	36	5180	16.0	16.0	No
			40	5200	16.0	16.0	
			44	5220	16.0	16.0	
			48	5240	16.0	16.0	

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
5.2 (OFDM) U-NII-1	802.11n	2 Tx HT40 CDD	38	5190	14.0	14.0	No
			46	5230	18.0	18.0	
		2 Tx HT40 STBC	38	5190	14.0	14.0	No
			46	5230	18.0	18.0	
		2 Tx HT40 SDM	38	5190	14.0	14.0	No
			46	5230	18.0	18.0	
		2 Tx HT40 TXBF	38	5190	14.0	14.0	No
			46	5230	18.0	18.0	
	802.11ac	1 Tx VHT20	36	5180	16.5		No
			40	5200	18.0		
			44	5220	18.0		
			48	5240	18.0		
		1 Tx VHT20	36	5180		16.5	No
			40	5200		18.0	
			44	5220		18.0	
			48	5240		18.0	
		1 Tx VHT40	38	5190	14.5		No
			46	5230	18.0		
			38	5190		14.5	
			46	5230		18.0	
		1 Tx VHT80	42	5210	13.0		No
			42	5210		13.0	

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
5.2 (OFDM) U-NII-1	802.11ac	2 Tx VHT20 CDD	36	5180	16.0	16.0	No
			40	5200	16.0	16.0	
			44	5220	16.0	16.0	
			48	5240	16.0	16.0	
		2 Tx VHT20 STBC	36	5180	16.0	16.0	No
			40	5200	17.0	17.0	
			44	5220	17.0	17.0	
			48	5240	17.0	17.0	
		2 Tx VHT20 SDM	36	5180	16.0	16.0	No
			40	5200	17.0	17.0	
			44	5220	17.0	17.0	
			48	5240	17.0	17.0	
		2 Tx VHT20 TXBF	36	5180	16.0	16.0	No
			40	5200	16.0	16.0	
			44	5220	16.0	16.0	
			48	5240	16.0	16.0	
		2 Tx VHT40 CDD	38	5190	14.0	14.0	No
			46	5230	18.0	18.0	
		2 Tx VHT40 STBC	38	5190	14.0	14.0	No
			46	5230	18.0	18.0	
		2 Tx VHT40 SDM	38	5190	14.0	14.0	No
			46	5230	18.0	18.0	
		2 Tx VHT40 TXBF	38	5190	14.0	14.0	No
			46	5230	18.0	18.0	
		2 Tx VHT80 CDD	42	5210	12.0	12.0	No
		2 Tx VHT80 STBC	42	5210	12.0	12.0	No
		2 Tx VHT80 SDM	42	5210	12.0	12.0	No
		2 Tx VHT80 TXBF	42	5210	12.0	12.0	No

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
5.3 (OFDM) U-NII-2A	802.11a	1 Tx	52	5260	18.0		Yes Subsequent Test Configuration
			56	5280	18.0		
			60	5300	18.0		
			64	5320	17.5		
			52	5260		18.0	
			56	5280		18.0	
			60	5300		18.0	
			64	5320		17.5	
		2 Tx CDD	52	5260	16.0	16.0	No
			56	5280	16.0	16.0	
			60	5300	16.0	16.0	
			64	5320	16.0	16.0	
	802.11n	1 Tx HT20	52	5260	18.0		No
			56	5280	18.0		
			60	5300	18.0		
			64	5320	17.5		
			52	5260		18.0	
			56	5280		18.0	
			60	5300		18.0	
			64	5320		17.5	
		1 Tx HT40	54	5270	18.0		Yes Initial Test Configuration
			62	5310	14.5		
			54	5270		18.0	
			62	5310		14.5	
		2 Tx HT20 CDD	52	5260	16.0	16.0	No
			56	5280	16.0	16.0	
			60	5300	16.0	16.0	
			64	5320	16.0	16.0	
		2 Tx HT20 STBC	52	5260	17.0	17.0	Yes Subsequent Test Configuration
			56	5280	17.0	17.0	
			60	5300	17.0	17.0	
			64	5320	16.5	16.5	
		2 Tx HT20 SDM	52	5260	17.0	17.0	No
			56	5280	17.0	17.0	
			60	5300	17.0	17.0	
			64	5320	16.5	16.5	
		2 Tx HT20 TXBF	52	5260	16.0	16.0	No
			56	5280	16.0	16.0	
			60	5300	16.0	16.0	
			64	5320	16.0	16.0	

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
5.3 (OFDM) U-NII-2A	802.11n	2 Tx HT40 CDD	54	5270	18.0	18.0	Yes Initial Test Configuration
			62	5310	13.0	13.0	
		2 Tx HT40 STBC	54	5270	18.0	18.0	No
			62	5310	13.0	13.0	
		2 Tx HT40 SDM	54	5270	18.0	18.0	No
			62	5310	13.0	13.0	
		2 Tx HT40 TXBF	54	5270	18.0	18.0	No
			62	5310	13.0	13.0	
	802.11ac	1 Tx VHT20	52	5260	18.0		No
			56	5280	18.0		
			60	5300	18.0		
			64	5320	17.5		
		1 Tx VHT20	52	5260		18.0	No
			56	5280		18.0	
			60	5300		18.0	
			64	5320		17.5	
		1 Tx VHT40	54	5270	18.0		No
			62	5310	14.5		
			54	5270		18.0	
			62	5310		14.5	
		1 Tx VHT80	58	5290	12.0		No
			58	5290		12.0	

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
5.3 (OFDM) U-NII-2A	802.11ac	2 Tx VHT20 CDD	52	5260	16.0	16.0	No
			56	5280	16.0	16.0	
			60	5300	16.0	16.0	
			64	5320	16.0	16.0	
		2 Tx VHT20 STBC	52	5260	17.0	17.0	No
			56	5280	17.0	17.0	
			60	5300	17.0	17.0	
			64	5320	16.5	16.5	
		2 Tx VHT20 SDM	52	5260	17.0	17.0	No
			56	5280	17.0	17.0	
			60	5300	17.0	17.0	
			64	5320	16.5	16.5	
		2 Tx VHT20 TXBF	52	5260	16.0	16.0	No
			56	5280	16.0	16.0	
			60	5300	16.0	16.0	
			64	5320	16.0	16.0	
		2 Tx VHT40 CDD	54	5270	18.0	18.0	No
			62	5310	13.0	13.0	
		2 Tx VHT40 STBC	54	5270	18.0	18.0	No
			62	5310	13.0	13.0	
		2 Tx VHT40 SDM	54	5270	18.0	18.0	No
			62	5310	13.0	13.0	
		2 Tx VHT40 TXBF	54	5270	18.0	18.0	No
			62	5310	13.0	13.0	
		2 Tx VHT80 CDD	58	5290	9.5	9.5	No
		2 Tx VHT80 STBC	58	5290	9.5	9.5	No
		2 Tx VHT80 SDM	58	5290	9.5	9.5	No
		2 Tx VHT80 TXBF	58	5290	9.5	9.5	No

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
5.5 (OFDM) U-NII-2C	802.11a	1 Tx	100	5500	18.0		Yes Subsequent Test Configuration
			104	5520	18.0		
			108	5540	18.0		
			112	5560	18.0		
			116	5580	18.0		
			120	5600	18.0		
			124	5620	18.0		
			128	5640	18.0		
			100	5500		18.0	Yes Subsequent Test Configuration
			104	5520		18.0	
			108	5540		18.0	
			112	5560		18.0	
			116	5580		18.0	
			120	5600		18.0	
			124	5620		18.0	
			128	5640		18.0	
	802.11a	2 Tx CDD	100	5500	14.5	14.5	No
			104	5520	14.5	14.5	
			108	5540	14.5	14.5	
			112	5560	14.5	14.5	
			116	5580	14.5	14.5	
			120	5600	14.5	14.5	
			124	5620	14.5	14.5	
			128	5640	14.5	14.5	
	802.11n	1 Tx HT20	100	5500	18.0		No
			104	5520	18.0		
			108	5540	18.0		
			112	5560	18.0		
			116	5580	18.0		
			120	5600	18.0		
			124	5620	18.0		
			128	5640	18.0		
			100	5500		18.0	
			104	5520		18.0	
			108	5540		18.0	
			112	5560		18.0	
			116	5580		18.0	
			120	5600		18.0	
			124	5620		18.0	
			128	5640		18.0	

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
5.5 (OFDM) U-NII-2C	802.11n	1 Tx HT40	102	5510	16.0		Yes Initial Test Configuration
			110	5550	18.0		
			118	5590	18.0		
			126	5630	18.0		
			102	5510		16.0	
			110	5550		18.0	
			118	5590		18.0	
			126	5630		18.0	
		2 Tx HT20 CDD	100	5500	14.5	14.5	No
			104	5520	14.5	14.5	
			108	5540	14.5	14.5	
			112	5560	14.5	14.5	
			116	5580	14.5	14.5	
			120	5600	14.5	14.5	
			124	5620	14.5	14.5	
			128	5640	14.5	14.5	
		2 Tx HT20 STBC	100	5500	17.0	17.0	No
			104	5520	17.0	17.0	
			108	5540	17.0	17.0	
			112	5560	17.0	17.0	
			116	5580	17.0	17.0	
			120	5600	17.0	17.0	
			124	5620	17.0	17.0	
			128	5640	17.0	17.0	
		2 Tx HT20 SDM	100	5500	17.0	17.0	No
			104	5520	17.0	17.0	
			108	5540	17.0	17.0	
			112	5560	17.0	17.0	
			116	5580	17.0	17.0	
			120	5600	17.0	17.0	
			124	5620	17.0	17.0	
			128	5640	17.0	17.0	
		2 Tx HT20 TXBF	100	5500	14.5	14.5	No
			104	5520	14.5	14.5	
			108	5540	14.5	14.5	
			112	5560	14.5	14.5	
			116	5580	14.5	14.5	
			120	5600	14.5	14.5	
			124	5620	14.5	14.5	
			128	5640	14.5	14.5	

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
5.5 (OFDM) U-NII-2C	802.11n	2 Tx HT40 CDD	102	5510	13.0	13.0	No
			110	5550	17.0	17.0	
			118	5590	17.0	17.0	
			126	5630	17.0	17.0	
		2 Tx HT40 STBC	102	5510	13.0	13.0	Yes Initial Test Configuration
			110	5550	18.0	18.0	
			118	5590	18.0	18.0	
			126	5630	18.0	18.0	
		2 Tx HT40 SDM	102	5510	13.0	13.0	No
			110	5550	18.0	18.0	
			118	5590	18.0	18.0	
			126	5630	18.0	18.0	
		2 Tx HT40 TXBF	102	5510	13.0	13.0	No
			110	5550	17.0	17.0	
			118	5590	17.0	17.0	
			126	5630	17.0	17.0	
	802.11ac	1 Tx VHT20	100	5500	18.0		No
			104	5520	18.0		
			108	5540	18.0		
			112	5560	18.0		
			116	5580	18.0		
			120	5600	18.0		
			124	5620	18.0		
			128	5640	18.0		
			100	5500		18.0	
			104	5520		18.0	
			108	5540		18.0	
			112	5560		18.0	
			116	5580		18.0	
			120	5600		18.0	
			124	5620		18.0	
			128	5640		18.0	
		1 Tx VHT40	102	5510	16.0		No
			110	5550	18.0		
			118	5590	18.0		
			126	5630	18.0		
			102	5510		16.0	
			110	5550		18.0	
			118	5590		18.0	
			126	5630		18.0	
		1 Tx VHT80	106	5530	12.0		No
			122	5610	18.0		
			138	5690	18.0		
			106	5530		12.0	
			122	5610		18.0	
			138	5690		18.0	
		1 Tx VHT80	106	5530	12.0		Yes Initial Test Configuration
			122	5610	18.0		
			106	5530		12.0	
			122	5610		18.0	

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
5.5 (OFDM) U-NII-2C	802.11ac	2 Tx VHT20 CDD	100	5500	14.5	14.5	No
			104	5520	14.5	14.5	
			108	5540	14.5	14.5	
			112	5560	14.5	14.5	
			116	5580	14.5	14.5	
			120	5600	14.5	14.5	
			124	5620	14.5	14.5	
			128	5640	14.5	14.5	
		2 Tx VHT20 STBC	100	5500	17.0	17.0	No
			104	5520	17.0	17.0	
			108	5540	17.0	17.0	
			112	5560	17.0	17.0	
			116	5580	17.0	17.0	
			120	5600	17.0	17.0	
			124	5620	17.0	17.0	
			128	5640	17.0	17.0	
		2 Tx VHT20 SDM	100	5500	17.0	17.0	No
			104	5520	17.0	17.0	
			108	5540	17.0	17.0	
			112	5560	17.0	17.0	
			116	5580	17.0	17.0	
			120	5600	17.0	17.0	
			124	5620	17.0	17.0	
			128	5640	17.0	17.0	
		2 Tx VHT20 TXBF	100	5500	14.5	14.5	No
			104	5520	14.5	14.5	
			108	5540	14.5	14.5	
			112	5560	14.5	14.5	
			116	5580	14.5	14.5	
			120	5600	14.5	14.5	
			124	5620	14.5	14.5	
			128	5640	14.5	14.5	

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
5.5 (OFDM) U-NII-2C	802.11ac	2 Tx VHT40 CDD	102	5510	13.0	13.0	No
			110	5550	17.0	17.0	
			118	5590	17.0	17.0	
			126	5630	17.0	17.0	
		2 Tx VHT40 STBC	102	5510	13.0	13.0	No
			110	5550	18.0	18.0	
			118	5590	18.0	18.0	
			126	5630	18.0	18.0	
		2 Tx VHT40 SDM	102	5510	13.0	13.0	No
			110	5550	18.0	18.0	
			118	5590	18.0	18.0	
			126	5630	18.0	18.0	
		2 Tx VHT40 TXBF	102	5510	13.0	13.0	No
			110	5550	17.0	17.0	
			118	5590	17.0	17.0	
			126	5630	17.0	17.0	
		2 Tx VHT80 CDD	106	5530	11.0	11.0	Yes Initial Test Configuration
			122	5610	18.0	18.0	
		2 Tx VHT80 STBC	106	5530	11.0	11.0	No
			122	5610	18.0	18.0	
		2 Tx VHT80 SDM	106	5530	11.0	11.0	No
			122	5610	18.0	18.0	
		2 Tx VHT80 TXBF	106	5530	11.0	11.0	No
			122	5610	17.0	17.0	

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
5.8 (OFDM) U-NII-3	802.11a	1 Tx	132	5660	18.0		Yes Subsequent Test Configuration
			136	5680	18.0		
			140	5700	17.5		
			144	5720	17.5		
			149	5745	18.0		
			153	5765	18.0		
			157	5785	18.0		
			161	5805	18.0		
			165	5825	18.0		
			132	5660		18.0	
		2 Tx CDD	136	5680		18.0	Yes Subsequent Test Configuration
			140	5700		17.5	
			144	5720		17.5	
			149	5745		18.0	
			153	5765		18.0	
			157	5785		18.0	
			161	5805		18.0	
			165	5825		18.0	
			132	5660	14.5	14.5	
			136	5680	14.5	14.5	
			140	5700	14.5	14.5	
			144	5720	14.5	14.5	
			149	5745	16.5	16.5	
			153	5765	18.0	18.0	
			157	5785	18.0	18.0	
			161	5805	18.0	18.0	
			165	5825	17.0	17.0	
	802.11n	1 Tx HT20	149	5745	18.0		No
			153	5765	18.0		
			157	5785	17.5		
			161	5805	17.5		
			149	5745	18.0		
			153	5765	18.0		
			157	5785	18.0		
			161	5805	18.0		
			165	5825	18.0		
			149	5745		18.0	
			153	5765		18.0	
			157	5785		17.5	
			161	5805		17.5	
			149	5745		18.0	
			153	5765		18.0	
			157	5785		18.0	
			161	5805		18.0	
			165	5825		18.0	

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
5.8 (OFDM) U-NII-3	802.11n	1 Tx HT40	134	5670	18.0		Yes Initial Test Configuration
			142	5710	18.0		
			151	5755	16.5		
			159	5795	18.0		
			134	5670		18.0	
			142	5710		18.0	
			151	5755		16.5	
			159	5795		18.0	
		2 Tx HT20 CDD	132	5660	14.5	14.5	No
			136	5680	14.5	14.5	
			140	5700	14.5	14.5	
			144	5720	14.5	14.5	
			149	5745	16.5	16.5	
			153	5765	18.0	18.0	
			157	5785	18.0	18.0	
			161	5805	18.0	18.0	
			165	5825	17.0	17.0	
		2 Tx HT20 STBC	132	5660	17.0	17.0	No
			136	5680	17.0	17.0	
			140	5700	16.5	16.5	
			144	5720	16.5	16.5	
			149	5745	16.5	16.5	
			153	5765	18.0	18.0	
			157	5785	18.0	18.0	
			161	5805	18.0	18.0	
			165	5825	17.0	17.0	
		2 Tx HT20 SDM	132	5660	17.0	17.0	No
			136	5680	17.0	17.0	
			140	5700	16.5	16.5	
			144	5720	16.5	16.5	
			149	5745	16.5	16.5	
			153	5765	18.0	18.0	
			157	5785	18.0	18.0	
			161	5805	18.0	18.0	
			165	5825	17.0	17.0	
		2 Tx HT20 TXBF	132	5660	14.5	14.5	No
			136	5680	14.5	14.5	
			140	5700	14.5	14.5	
			144	5720	14.5	14.5	
			149	5745	16.5	16.5	
			153	5765	18.0	18.0	
			157	5785	18.0	18.0	
			161	5805	18.0	18.0	
			165	5825	17.0	17.0	

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
5.8 (OFDM) U-NII-3	802.11n	2 Tx HT40 CDD	134	5670	17.0	17.0	Yes Initial Test Configuration
			142	5710	17.0	17.0	
			151	5755	15.0	15.0	
			159	5795	17.0	17.0	
		2 Tx HT40 STBC	134	5670	17.0	17.0	No
			142	5710	17.0	17.0	
			151	5755	15.0	15.0	
			159	5795	17.0	17.0	
		2 Tx HT40 SDM	134	5670	17.0	17.0	No
			142	5710	17.0	17.0	
			151	5755	15.0	15.0	
			159	5795	17.0	17.0	
		2 Tx HT40 TXBF	134	5670	17.0	17.0	No
			142	5710	17.0	17.0	
			151	5755	15.0	15.0	
			159	5795	17.0	17.0	
	802.11ac	1 Tx VHT20	132	5660	18.0		No
			136	5680	18.0		
			140	5700	17.5		
			144	5720	17.5		
			149	5745	18.0		
			153	5765	18.0		
			157	5785	18.0		
			161	5805	18.0		
			165	5825	18.0		
			132	5660		18.0	
			136	5680		18.0	
			140	5700		17.5	
			144	5720		17.5	
			149	5745		18.0	
			153	5765		18.0	
			157	5785		18.0	
			161	5805		18.0	
			165	5825		18.0	

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
5.8 (OFDM) U-NII-3	802.11ac	1 Tx VHT40	134	5670	18.0		No
			142	5710	18.0		
			151	5755	16.5		
			159	5795	18.0		
			134	5670		18.0	
			142	5710		18.0	
			151	5755		16.5	
			159	5795		18.0	
		1 Tx VHT80	138	5690	18.0		Yes Initial Test Configuration
			155	5775	15.5		
			138	5690		18.0	
			155	5775		15.5	
		2 Tx VHT20 CDD	132	5660	14.5	14.5	No
			136	5680	14.5	14.5	
			140	5700	14.5	14.5	
			144	5720	14.5	14.5	
			149	5745	16.5	16.5	
			153	5765	18.0	18.0	
			157	5785	18.0	18.0	
			161	5805	18.0	18.0	
		2 Tx VHT20 STBC	132	5660	17.0	17.0	No
			136	5680	17.0	17.0	
			140	5700	16.5	16.5	
			144	5720	16.5	16.5	
			149	5745	16.5	16.5	
			153	5765	18.0	18.0	
			157	5785	18.0	18.0	
			161	5805	18.0	18.0	
		2 Tx VHT20 SDM	132	5660	17.0	17.0	No
			136	5680	17.0	17.0	
			140	5700	16.5	16.5	
			144	5720	16.5	16.5	
			149	5745	16.5	16.5	
			153	5765	18.0	18.0	
			157	5785	18.0	18.0	
			161	5805	18.0	18.0	
			165	5825	17.0	17.0	

Wi-Fi 5 GHz Bands Measured Results continued

Band (GHz)	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	Measured Avg Power (dBm)		SAR Test (Yes/No)
					WiFi 1	WiFi 2	
					Chain 1	Chain 2	
5.8 (OFDM) U-NII-3	802.11ac	2 Tx VHT20 TXBF	132	5660	14.5	14.5	No
			136	5680	14.5	14.5	
			140	5700	14.5	14.5	
			144	5720	14.5	14.5	
			149	5745	16.5	16.5	
			153	5765	18.0	18.0	
			157	5785	18.0	18.0	
			161	5805	18.0	18.0	
			165	5825	17.0	17.0	
		2 Tx VHT40 CDD	134	5670	17.0	17.0	No
			142	5710	17.0	17.0	
			151	5755	15.0	15.0	
			159	5795	17.0	17.0	
		2 Tx VHT40 STBC	134	5670	17.0	17.0	No
			142	5710	17.0	17.0	
			151	5755	15.0	15.0	
			159	5795	17.0	17.0	
		2 Tx VHT40 SDM	134	5670	17.0	17.0	No
			142	5710	17.0	17.0	
			151	5755	15.0	15.0	
			159	5795	17.0	17.0	
		2 Tx VHT40 TXBF	134	5670	17.0	17.0	No
			142	5710	17.0	17.0	
			151	5755	15.0	15.0	
			159	5795	17.0	17.0	
		2 Tx VHT80 CDD	138	5690	18.0	18.0	Yes Initial Test Configuration
			155	5775	13.5	13.5	
		2 Tx VHT80 STBC	138	5690	18.0	18.0	No
			155	5775	13.5	13.5	
		2 Tx VHT80 SDM	138	5690	18.0	18.0	No
			155	5775	13.5	13.5	
		2 Tx VHT80 TXBF	138	5690	17.0	17.0	No
			155	5775	13.5	13.5	

8.3. Bluetooth Measured Power

Band (GHz)	Mode	Ch #	Freq. (MHz)	Avg Power (dBm)
2.4	V2.1 + EDR, GFSK	0	2402	11.7
		39	2441	11.8
		78	2480	11.8
	V2.1+ EDR, QPSK	0	2402	9.7
		39	2441	9.5
		78	2480	9.3
	V2.1 BLE, 8PSK	0	2402	9.8
		19	2440	9.6
		39	2480	9.4

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 $\pm 2^\circ\text{C}$ of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

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 C

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
11/12/2014	Body 2450	e'	50.6900	Relative Permittivity (ϵ_r):	50.69	52.70	-3.81	5
		e"	14.5900	Conductivity (σ):	1.99	1.95	1.93	5
	Body 2410	e'	50.9700	Relative Permittivity (ϵ_r):	50.97	52.76	-3.39	5
		e"	14.4900	Conductivity (σ):	1.94	1.91	1.79	5
	Body 2475	e'	50.6400	Relative Permittivity (ϵ_r):	50.64	52.67	-3.85	5
		e"	14.7000	Conductivity (σ):	2.02	1.99	1.91	5
12/4/2014	Body 2450	e'	52.4400	Relative Permittivity (ϵ_r):	52.44	52.70	-0.49	5
		e"	14.7100	Conductivity (σ):	2.00	1.95	2.76	5
	Body 2410	e'	52.1900	Relative Permittivity (ϵ_r):	52.19	52.76	-1.08	5
		e"	14.6900	Conductivity (σ):	1.97	1.91	3.20	5
	Body 2475	e'	52.2400	Relative Permittivity (ϵ_r):	52.24	52.67	-0.81	5
		e"	14.6700	Conductivity (σ):	2.02	1.99	1.70	5

SAR Lab D

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
11/17/2014	Body 5180	e'	47.3300	Relative Permittivity (ϵ_r):	47.33	49.05	-3.50	5
		e"	18.7300	Conductivity (σ):	5.39	5.27	2.34	5
	Body 5200	e'	47.3200	Relative Permittivity (ϵ_r):	47.32	49.02	-3.47	5
		e"	18.7500	Conductivity (σ):	5.42	5.29	2.39	5
	Body 5600	e'	46.6300	Relative Permittivity (ϵ_r):	46.63	48.48	-3.81	5
		e"	19.1900	Conductivity (σ):	5.98	5.76	3.72	5
	Body 5800	e'	46.3300	Relative Permittivity (ϵ_r):	46.33	48.20	-3.88	5
		e"	19.4100	Conductivity (σ):	6.26	6.00	4.33	5
	Body 5825	e'	46.3400	Relative Permittivity (ϵ_r):	46.34	48.20	-3.86	5
		e"	19.4400	Conductivity (σ):	6.30	6.00	4.94	5
11/20/2014	Body 5180	e'	47.8300	Relative Permittivity (ϵ_r):	47.83	49.05	-2.48	5
		e"	18.6900	Conductivity (σ):	5.38	5.27	2.12	5
	Body 5200	e'	47.7900	Relative Permittivity (ϵ_r):	47.79	49.02	-2.51	5
		e"	18.6900	Conductivity (σ):	5.40	5.29	2.06	5
	Body 5600	e'	46.9600	Relative Permittivity (ϵ_r):	46.96	48.48	-3.13	5
		e"	19.1400	Conductivity (σ):	5.96	5.76	3.45	5
	Body 5800	e'	46.7600	Relative Permittivity (ϵ_r):	46.76	48.20	-2.99	5
		e"	19.3200	Conductivity (σ):	6.23	6.00	3.84	5
	Body 5825	e'	46.6300	Relative Permittivity (ϵ_r):	46.63	48.20	-3.26	5
		e"	19.2200	Conductivity (σ):	6.23	6.00	3.75	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	899	9/10/2014	2450	1g	52.3	50.5
				10g	24.3	23.5
D5GHzV2	1138	9/18/2014	5200	1g	81.4	75.4
				10g	23.3	21.0
			5600	1g	85.1	81.9
				10g	24.2	22.6
			5800	1g	80.6	75.2
				10g	23.0	20.8

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 C

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
11/12/2014	D2450V2	899	Body	1g	4.75	47.5	50.5	-5.94	1, 2
				10g	2.20	22.0	23.5	-6.38	
12/4/2014	D2450V2	899	Body	1g	5.17	51.7	50.5	2.38	
				10g	2.39	23.9	23.5	1.70	

SAR Lab D

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
11/17/2014	D5GHzV2 (5.2GHz)	1138	Body	1g	8.05	80.5	75.4	6.76	3, 4
				10g	2.26	22.6	21.0	7.62	
	D5GHzV2 (5.6GHz)	1138	Body	1g	8.59	85.9	81.9	4.88	
				10g	2.35	23.5	22.6	3.98	
	D5GHzV2 (5.8GHz)	1138	Body	1g	7.92	79.2	75.2	5.32	
				10g	2.20	22.0	20.8	5.77	
11/20/2014	D5GHzV2 (5.2GHz)	1138	Body	1g	7.53	75.3	75.4	-0.13	
				10g	2.10	21.0	21.0	0.00	
	D5GHzV2 (5.6GHz)	1138	Body	1g	8.46	84.6	81.9	3.30	
				10g	2.32	23.2	22.6	2.65	
	D5GHzV2 (5.8GHz)	1138	Body	1g	7.94	79.4	75.2	5.59	
				10g	2.19	21.9	20.8	5.29	

10.3. SAR Scan 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	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: $\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$	≤ 2 GHz: ≤ 15 mm $2 - 3$ GHz: ≤ 12 mm	$3 - 4$ GHz: ≤ 12 mm $4 - 6$ GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

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

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

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

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be larger than the step size in Z-direction.

11. SAR Test Results

SAR Test Reduction criteria are as follows:

Initial Test Position SAR Test Reduction

For both DSSS and OFDM wireless modes, when an Initial Test Configuration is found to require SAR measurements, an Initial Test Position is established for each applicable exposure configuration (Head, Body, etc.) using either:

- Design implementation details from the manufacturer, or
- Investigative results by the test lab, obtained by performing area scans on the Initial Test Configuration for all applicable test positions and identifying the highest measured SAR from the area scan-only measurements.

Complete SAR scans are then performed on the established Initial Test Position on each exposure configuration, using the Initial Test Configuration. When the reported SAR for this Initial Test Position is:

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in the exposure configuration and wireless mode combination within the frequency band or aggregated band.
- > 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 closest/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 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 test 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.

SAR Test Reduction for OFDM using Initial Test Configuration Procedures

Along with the Initial Test Position test reduction guidelines, the following procedures are also applied to streamline SAR measurement requirements when multiple OFDM configurations are supported:

1. When the reported SAR for the highest output power channel in the Initial Test Configuration is > 0.8 W/kg, SAR measurement is required for the next highest measured output power channel in the Initial Test Configuration until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
2. For Subsequent Test Configurations with output power ≤ 0.5 dB lower than the Initial Test Configuration:
 - No further SAR measurement is required for the exposure condition and frequency band or aggregated band combination in the Subsequent Test Configurations when the reported SAR from the Initial Test Configuration is ≤ 0.8 W/kg.
 - SAR is required in the Subsequent Test Configurations for all conditions in the Initial Test Configuration and subsequent test positions with reported SAR > 0.8 and ≤ 1.2 W/kg, using the following criteria for test channel selection:
 - o The highest measured output channel in the Subsequent Test Configurations, if the measured output power is different among channels.
 - o The channel closest to the center frequency of the larger bandwidth configuration channel- assuming a larger bandwidth configuration was established as the Initial Test Configuration- if the output power measured across the channels in the Subsequent Test Configuration is the same.
 - o SAR measurement for the subsequent highest powered channel in the Subsequent Test Configurations is required only when the reported SAR from the initial measurement in the Subsequent Test Configuration is > 1.2 W/kg.

SAR Test Reduction for OFDM using Initial Test Configuration Procedures (continued)

3. For Subsequent Test Configurations with output power > 0.5 dB lower than the Initial Test Configuration, SAR measurement is not required for exposure condition and frequency band or aggregated band combinations with highest reported SAR ≤ 1.2 W/kg in the Initial Test Configuration measurements.
4. When the highest reported SAR for the Initial Test Configuration is > 1.2 W/kg, the Initial Test Configuration SAR measurement procedure is applied to the Subsequent Test Configuration.
 - The highest output power channel for the initial measurement, as well as the number of potentially required test channels, is determined by the channel bandwidth support in the Subsequent Test Configuration.
 - Additional output power measurements may be required.
 - The test channel reduction threshold for Subsequent Test Configuration is decreased from the usual > 1.2 W/kg to > 0.8 W/kg.
5. Beyond the Subsequent Test Configuration, SAR measurement requirements for the remaining transmission modes are determined by applying the Subsequent Test Configuration in the following manner:
 - Replace Subsequent Test Configuration with Next Subsequent Test Configuration.
 - Replace Initial Test Configuration with Preceding Test Configuration

SAR Test Reduction for Wi-Fi 2.4 GHz

1. 2.4 GHz 802.11b DSSS:
 - When the reported SAR of the highest maximum output channel for the exposure configuration is ≤ 0.8 W/kg, no further testing is required for that exposure configuration for 802.11b DSSS.
 - When the reported SAR is > 0.8 W/kg, SAR is required for the next highest measured output channel in that exposure configuration. When any reported SAR is > 1.2 W/kg, SAR is required for the 3rd channel; i.e., all channels require testing.
2. 2.4 GHz 802.11g/n OFDM:
 - SAR is not required for 802.11g/n OFDM when its specified output power is ≥ 1 dB lower than that specified for 802.11b DSSS and the highest reported SAR for 802.11b DSSS is ≤ 1.2 W/kg.
 - SAR not required for 802.11g/n OFDM when its specified output power is ≤ 0.25 dB higher and < 1 dB lower than that specified 802.11b DSSS and the highest reported SAR for 802.11b DSSS is ≤ 0.8 W/kg.

SAR Test Reduction for Wi-Fi 5 GHz bands

1. 5.15 – 5.25 and 5.25 – 5.35 GHz Bands (UNII Band 1 and UNII Band 2A)
 - With respect to the Initial Test Configuration and Initial Test Position procedures, SAR is initially measured for:
 - o UNII Band 2A, if the output power specified for both bands is the same or higher on UNII Band 2A.
 - o UNII Band 1, if it has the higher specified output power of the two bands.
 - If the highest reported SAR from the initially measured band is:
 - o ≤ 1.2 W/kg, SAR is not required for the remaining band.
 - o > 1.2 W/kg, and the difference in specified output power is ≤ 1 dB, both bands should be tested independently for SAR; otherwise, the Initial Test Configuration and Initial Test Position procedures should be applied.

SAR Test Reduction for Wi-Fi 5 GHz bands (continued)

2. 5.470 – 5.725, 5.725 – 5.825 GHz and 5.725 – 5.850 GHz Bands (UNII Band 2C and UNII 3)
 - If TDWR restriction does not apply:
 - o The channels in the frequency range of 5.60 – 5.65 GHz should be considered for testing.
 - If TWDR restriction does not apply, and the band gap channels between the two bands are supported:
 - o The channels in UNII Band 2C above 5.65 GHz are then grouped with the channels in UNII Band 3.
 - o Evaluation for test requirements is performed independently for each band according to the grouping of channels described above.
 - The Initial Test Configuration and Initial Test Position procedures are then applied independently for each band.
 - o Unlike UNII Band 1 and UNII Band 2A, test reduction or exclusion is not interdependent between UNII Band 2C and UNII Band 3.

11.1. Wi-Fi 2.4 GHz

Band	Mode	No. of Transmitters	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)				SAR (W/kg)								Plot No.
							Chain 1		Chain 2		Chain 1				Chain 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 (DSSS)	802.11b	1 Tx	0	Rear	1	2412	19.5	19.5			0.869	0.460	0.869	0.460					
					6	2437	19.5	19.5			0.861	0.455	0.861	0.455					
					11	2462	19.5	19.5			0.851	0.466	0.851	0.466					
				Rear	1	2412			19.5	19.5					0.801	0.448	0.801	0.448	
					6	2437			19.5	19.5					0.811	0.441	0.811	0.441	
					11	2462			19.5	19.5					0.776	0.430	0.776	0.430	
		2 Tx CDD	0	Rear	1	2412	19.5	19.5	19.5	19.5	0.888	0.471	0.888	0.471	0.879	0.467	0.879	0.467	1
					6	2437	19.5	19.5	19.5	19.5	0.854	0.455	0.854	0.455	0.858	0.452	0.858	0.452	
					10	2457	19.5	19.5	19.5	19.5	0.812	0.436	0.812	0.436	0.835	0.439	0.835	0.439	
2.4GHz (OFDM)	802.11g	1 Tx	0	Rear	3	2422	19.0	19.0			0.777	0.438	0.777	0.438					
					6	2437			19.0	19.0					0.849	0.457	0.849	0.457	
		2 Tx CDD	0	Rear	3	2422	19.0	19.0	19.0	19.0	0.846	0.471	0.846	0.471	0.794	0.452	0.794	0.452	

11.2. Wi-Fi 5 GHz**11.2.1. 5.3 GHz Band**

Band	Mode	No. of Transmitters	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)				SAR (W/kg)								Plot No.
							Chain 1		Chain 2		Chain 1				Chain 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 (OFDM) U-NII-2A	802.11a	1 Tx	0	Rear	52	5260	18.0	18.0			0.774	0.298	0.744	0.298					
					52	5260			18.0	18.0					0.848	0.328	0.848	0.328	
	802.11n	2 Tx HT20 STBC	0	Rear	52	5260	17.0	17.0	17.0	17.0	0.857	0.332	0.857	0.332	0.762	0.302	0.762	0.302	
					60	5300	17.0	17.0	17.0	17.0	0.736	0.290	0.736	0.290	0.739	0.285	0.739	0.285	
		1 Tx HT40	0	Rear	54	5270	18.0	18.0			0.897	0.361	0.897	0.361					2
					62	5310	14.5	14.5			0.210	0.080	0.210	0.080					
					54	5270			18.0	18.0					0.873	0.348	0.873	0.348	
					62	5310			14.5	14.5					0.175	0.054	0.175	0.054	
		2 Tx HT40 CDD	0	Rear	54	5270	18.0	18.0	18.0	18.0	0.813	0.329	0.813	0.329	0.870	0.348	0.870	0.348	
					62	5310	13.0	13.0	13.0	13.0	0.224	0.085	0.224	0.085	0.212	0.077	0.212	0.077	

11.2.2. 5.5 GHz Band

Band	Mode	No. of Transmitters	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)				SAR (W/kg)								Plot No.
							Chain 1		Chain 2		Chain 1				Chain 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 (OFDM) U-NII-2C	802.11a	1 Tx	0	Rear	124	5620	18.0	18.0			0.919	0.332	0.919	0.332					
					124	5620			18.0	18.0					0.867	0.313	0.867	0.313	
	802.11n	1 Tx HT40	0	Rear	110	5550	18.0	18.0			0.866	0.320	0.866	0.320					
					126	5630	18.0	18.0			0.949	0.346	0.949	0.346					
					110	5550			18.0	18.0					0.958	0.355	0.958	0.355	
					126	5630			18.0	18.0					0.984	0.359	0.984	0.359	3
		2Tx HT40 STBC	0	Rear	110	5550	18.0	18.0	18.0	18.0	0.908	0.336	0.908	0.336	0.901	0.331	0.901	0.331	
					126	5630	18.0	18.0	18.0	18.0	0.926	0.333	0.926	0.333	0.849	0.305	0.849	0.305	
	802.11ac	1 Tx HT80	0	Rear	106	5530	12.0	12.0			0.382	0.142	0.382	0.142					
					122	5610	18.0	18.0			0.896	0.323	0.896	0.323					
					106	5530			12.0	12.0					0.396	0.144	0.396	0.144	
					122	5610			18.0	18.0					0.926	0.346	0.926	0.346	
		2 Tx HT80 CDD	0	Rear	106	5530	11.0	11.0	11.0	11.0	0.133	0.046	0.133	0.046	0.130	0.040	0.130	0.040	
					122	5610	18.0	18.0	18.0	18.0	0.843	0.317	0.843	0.317	0.883	0.337	0.883	0.337	

11.2.3. 5.8 GHz Band

Band	Mode	No. of Transmitters	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)				SAR (W/kg)								Plot No.
							Chain 1		Chain 2		Chain 1				Chain 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 (OFDM) U-NII-3	802.11a	1 Tx	0	Rear	132	5660	18.0	18.0			0.878	0.317	0.878	0.317					4
				Rear	132	5660			18.0	18.0					0.774	0.277	0.774	0.277	
		2 Tx CDD	0	Rear	153	5765	18.0	18.0	18.0	18.0	0.832	0.292	0.832	0.292	0.721	0.253	0.721	0.253	
	802.11n	1 Tx HT 40	0	Rear	134	5670	18.0	18.0			0.864	0.309	0.864	0.309					
					159	5795	18.0	18.0			0.821	0.291	0.821	0.291					
					134	5670			18.0	18.0					0.786	0.283	0.786	0.283	
					159	5795			18.0	18.0					0.821	0.291	0.821	0.291	
		2 Tx HT40 CDD	0	Rear	159	5795	17.0	17.0	17.0	17.0	0.834	0.291	0.834	0.291	0.832	0.296	0.832	0.296	
	802.11ac	1 Tx VHT 80	0	Rear	138	5690	18.0	18.0			0.856	0.306	0.856	0.306					
					155	5775	15.5	15.5			0.392	0.137	0.392	0.137					
					138	5690			18.0	18.0					0.834	0.299	0.834	0.299	
					155	5775			15.5	15.5					0.424	0.147	0.424	0.147	
		2 Tx VHT 80	0	Rear	138	5690	18.0	18.0	18.0	18.0	0.856	0.306	0.856	0.306	0.739	0.266	0.739	0.266	
					155	5775	13.5	13.5	13.5	13.5	0.303	0.096	0.303	0.096	0.278	0.092	0.278	0.092	

11.3. Bluetooth

Mode	Test Position	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		SAR (W/kg)				Plot No.
					Chain 1		Chain 1				
					Tune-up Limit	Measured	Measured		Scaled		
							1-g	10-g	1-g	10-g	
GFSK	Rear	0	39	2441	12.0	11.8	0.150	0.086	0.157	0.090	5

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 ($\sim 10\%$ 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	Wi-Fi 802.11b/g/n	0.888
	Bluetooth	N/A
5200	Wi-Fi 802.11a/n/ac	N/A
5300	Wi-Fi 802.11a/n/ac	0.897
5500	Wi-Fi 802.11a/n/ac	0.984
5800	Wi-Fi 802.11a/n/ac	0.878

12.2. Repeated Measurement Results

Band	Test Position	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	1-g SAR (W/kg)		1-g SAR (W/kg)		Largest to Smallest SAR Ratio		Note
						Original		Repeated				
						Chain 1	Chain 2	Chain 1	Chain 2	Chain 1	Chain 2	
2.4GHz (DSSS)	Rear	802.11b	1 Tx	1	2412	0.888		0.864		1.03		1
Band	Test Position	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	1-g SAR (W/kg)		1-g SAR (W/kg)		Largest to Smallest SAR Ratio		Note
						Original		Repeated				
						Chain 1	Chain 2	Chain 1	Chain 2	Chain 1	Chain 2	
5.3GHz (OFDM) U-NII-2A	Rear	802.11a	1 Tx	132	5660	0.897		0.865		1.04		1
Band	Test Position	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	1-g SAR (W/kg)		1-g SAR (W/kg)		Largest to Smallest SAR Ratio		Note
						Original		Repeated				
						Chain 1	Chain 2	Chain 1	Chain 2	Chain 1	Chain 2	
5.5GHz (OFDM) U-NII-2C	Rear	802.11n	1 Tx HT40 CDD	126	5630		0.984		0.944		1.04	1
Band	Test Position	Mode	No. of Transmitters	Ch. #	Freq. (MHz)	1-g SAR (W/kg)		1-g SAR (W/kg)		Largest to Smallest SAR Ratio		Note
						Original		Repeated				
						Chain 1	Chain 2	Chain 1	Chain 2	Chain 1	Chain 2	
5.8GHz (OFDM) U-NII-3	Rear	802.11a	1 Tx	132	5660	0.878		0.857		1.02		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:

SAR₁ 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

SAR₂ 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. Sum of the SAR for U-NII Band & BT

Band (GHz)	RF Exposure condition	Test Position	Simultaneous Transmission Scenario				Σ 1-g SAR (W/kg)
			UNII Band			Bluetooth (Chain 1)	
			Chain 1	Chain 2	Chain 1 + Chain 2		
5.3GHz (OFDM) U-NII-2A	Body	Rear	0.897			0.157	1.054
				0.873		0.157	1.030
					0.870	0.157	1.027

Band (GHz)	RF Exposure condition	Test Position	Simultaneous Transmission Scenario				Σ 1-g SAR (W/kg)
			UNII Band			Bluetooth (Chain 1)	
			Chain 1	Chain 2	Chain 1 + Chain 2		
5.5GHz (OFDM) U-NII-2C	Body	Rear	0.949			0.157	1.106
				0.984		0.157	1.141
					0.926	0.157	1.083

Band (GHz)	RF Exposure condition	Test Position	Simultaneous Transmission Scenario				Σ 1-g SAR (W/kg)
			UNII Band			Bluetooth (Chain 1)	
			Chain 1	Chain 2	Chain 1 + Chain 2		
5.8GHz (OFDM) U-NII-3	Body	Rear	0.878			0.157	1.035
				0.834		0.157	0.991
					0.856	0.157	1.013

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.

Appendixes

Refer to separated files for the following appendixes.

A_14U18574v0 SAR Photos

B_14U18574v0 SAR System Check Plots

C_14U18574v0 SAR Highest Test Plots

D_14U18574v0 SAR Tissue Ingredients

E_14U18574v0 SAR Probe Cal. Certificates

F_14U18574v0 SAR Dipole Cal. Certificates

END OF REPORT