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RF EXPOSURE REPORT

Applicant Name:
Apple Inc.
One Apple Park Way
Cupertino, CA 95014 USA

Date of Testing:
11/14/2024 – 12/08/2024
Test Report Issue Date:
01/22/2025
Test Site/Location:
Element, Morgan Hill, CA, USA
Document Serial No.:
1C2410210076-01.BCG (Rev 1)

FCC ID: **BCGA3354**

APPLICANT: **APPLE, INC.**

DUT Type: Tablet Device
Application Type: Certification
FCC Rule Part(s): CFR §2.1093
Models: A3354

Equipment Class	Band & Mode	Tx Frequency	SAR 1g Body (W/kg)
DTS	2.4 GHz WIFI	2412 - 2472 MHz	1.19
NII	5 GHz WIFI	U-NII-1: 5180 - 5240 MHz U-NII-2A: 5260 - 5320 MHz U-NII-2C: 5500 - 5720 MHz U-NII-3: 5745 - 5825 MHz	1.19
DSS/DTS	2.4 GHz Bluetooth	2402 - 2480 MHz	0.21
Simultaneous SAR per KDB 690783 D01v01r03:			1.40

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.8 of this report; for North American frequency bands only.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. Test results reported herein relate only to the item(s) tested.

RJ Ortanez
Executive Vice President

The SAR Tick is an initiative of the Mobile & Wireless Forum (MWF). While a product may be considered eligible, use of the SAR Tick logo requires an agreement with the MWF. Further details can be obtained by emailing: sartick@mwfai.info.

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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
2.4 GHz WIFI	Voice/Data	2412 - 2472 MHz
5 GHz WIFI	Voice/Data	U-NII-1: 5180 - 5240 MHz U-NII-2A: 5260 - 5320 MHz U-NII-2C: 5500 - 5720 MHz U-NII-3: 5745 - 5825 MHz
2.4 GHz Bluetooth	Data	2402 - 2480 MHz

1.2 Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D04v01.

1.2.1 Maximum WLAN Time-Averaged Output Power

Mode	IEEE 802.11 (Maximum in dBm) - Antenna WF7b											
	Channel	SISO	SISO	SISO	SISO	SISO	SISO	SISO	SISO	MIMO	MIMO	MIMO	MIMO
		b (Maximum)	b (Nominal)	g (Maximum)	g (Nominal)	n/ac (Maximum)	n/ac (Nominal)	ax SU (Maximum)	ax SU (Nominal)	n/ac (Maximum)	n/ac (Nominal)	ax SU (Maximum)	ax SU (Nominal)
2.4 GHz WIFI 20 MHz Bandwidth	1	19.50	18.00	15.50	14.00	15.50	14.00	15.50	14.00	15.00	13.50	15.00	13.50
	2	19.50	18.00	18.50	17.00	18.50	17.00	17.00	15.50	17.50	16.00	16.50	15.00
	3	19.50	18.00	18.50	17.00	18.50	17.00	18.50	17.00	18.00	16.50	18.00	16.50
	4	19.50	18.00	18.50	17.00	18.50	17.00	18.50	17.00	18.00	16.50	18.00	16.50
	5	19.50	18.00	18.50	17.00	18.50	17.00	18.50	17.00	18.00	16.50	18.00	16.50
	6	19.50	18.00	19.00	17.50	18.50	17.00	18.50	17.00	18.50	17.00	18.50	17.00
	7	19.50	18.00	19.00	17.50	18.50	17.00	18.50	17.00	18.50	17.00	18.50	17.00
	8	19.50	18.00	19.00	17.50	18.50	17.00	18.50	17.00	18.50	17.00	18.50	17.00
	9	19.50	18.00	18.50	17.00	18.50	17.00	18.50	17.00	18.50	17.00	18.50	17.00
	10	19.50	18.00	18.00	16.50	18.00	16.50	17.50	16.00	18.00	16.50	17.00	15.50
	11	19.50	18.00	15.00	13.50	15.00	13.50	14.50	13.00	15.00	13.50	14.50	13.00
	12	15.00	13.50	13.50	12.00	13.50	12.00	12.00	10.50	13.50	12.00	12.00	10.50
	13	12.00	10.50	6.00	4.50	6.00	4.50	NS	NS	5.50	4.00	NS	NS

Note: Targets for 802.11ax RU operations can be found in 802.11ax RU SAR Exclusion Appendix.

Mode	IEEE 802.11 (Maximum in dBm) - Antenna WF8											
	Channel	SISO	SISO	SISO	SISO	SISO	SISO	SISO	SISO	MIMO	MIMO	MIMO	MIMO
		b (Maximum)	b (Nominal)	g (Maximum)	g (Nominal)	n/ac (Maximum)	n/ac (Nominal)	ax SU (Maximum)	ax SU (Nominal)	n/ac (Maximum)	n/ac (Nominal)	ax SU (Maximum)	ax SU (Nominal)
2.4 GHz WIFI 20 MHz Bandwidth	1	20.00	18.50	15.50	14.00	15.50	14.00	15.50	14.00	15.00	13.50	15.00	13.50
	2	20.00	18.50	18.50	17.00	18.50	17.00	17.00	15.50	17.50	16.00	16.50	15.00
	3	20.00	18.50	18.50	17.00	18.50	17.00	18.50	17.00	18.00	16.50	18.00	16.50
	4	20.00	18.50	18.50	17.00	18.50	17.00	18.50	17.00	18.00	16.50	18.00	16.50
	5	20.00	18.50	18.50	17.00	18.50	17.00	18.50	17.00	18.00	16.50	18.00	16.50
	6	20.00	18.50	19.00	17.50	18.50	17.00	18.50	17.00	18.50	17.00	18.50	17.00
	7	20.00	18.50	19.00	17.50	18.50	17.00	18.50	17.00	18.50	17.00	18.50	17.00
	8	20.00	18.50	19.00	17.50	18.50	17.00	18.50	17.00	18.50	17.00	18.50	17.00
	9	20.00	18.50	18.50	17.00	18.50	17.00	18.50	17.00	18.50	17.00	18.50	17.00
	10	20.00	18.50	18.00	16.50	18.00	16.50	17.50	16.00	18.00	16.50	17.00	15.50
	11	20.00	18.50	15.00	13.50	15.00	13.50	14.50	13.00	15.00	13.50	14.50	13.00
	12	15.00	13.50	13.50	12.00	13.50	12.00	12.00	10.50	13.50	12.00	12.00	10.50
	13	12.00	10.50	6.00	4.50	6.00	4.50	NS	NS	5.50	4.00	NS	NS

Note: Targets for 802.11ax RU operations can be found in 802.11ax RU SAR Exclusion Appendix.

Mode	Channel	IEEE 802.11 (Maximum in dBm) - Antenna WF7a													
		SISO	SISO	SISO	SISO	SISO	SISO	MIMO CDD	MIMO CDD	MIMO CDD	MIMO CDD	MIMO SDM	MIMO SDM	MIMO SDM	MIMO SDM
		a (Maximum)	a (Nominal)	n/ac (Maximum)	n/ac (Nominal)	ax SU (Maximum)	ax SU (Nominal)	n/ac (Maximum)	n/ac (Nominal)	ax SU (Maximum)	ax SU (Nominal)	n/ac (Maximum)	n/ac (Nominal)	ax SU (Maximum)	ax SU (Nominal)
5 GHz WIFI 20 MHz Bandwidth	36	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00
	40	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00
	44	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00
	48	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00
	52	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50
	56	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50
	60	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50
	64	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50
	100	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	104	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	108	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	112	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	116	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	120	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	124	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	128	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	132	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	136	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	140	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	144	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	149	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	153	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	157	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	161	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	165	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
5 GHz WIFI 40 MHz Bandwidth	38	[redacted]		14.50	13.00	14.50	13.00	13.50	12.00	12.00	10.50	13.50	12.00	12.00	10.50
	46	[redacted]		15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00
	54	[redacted]		15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50	15.00	13.50
	62	[redacted]		13.50	12.00	13.00	11.50	13.00	11.50	12.50	11.00	13.00	11.50	12.50	11.00
	102	[redacted]		13.50	12.00	13.50	12.00	12.50	11.00	12.00	10.50	12.50	11.00	12.00	10.50
	110	[redacted]		13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	118	[redacted]		13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	126	[redacted]		13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	134	[redacted]		13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	142	[redacted]		13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	151	[redacted]		13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	159	[redacted]		13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
5 GHz WIFI 80 MHz Bandwidth	42	[redacted]		12.50	11.00	12.00	10.50	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00
	58	[redacted]		10.50	9.00	10.00	8.50	10.00	8.50	9.50	8.00	10.00	8.50	9.50	8.00
	106	[redacted]		10.50	9.00	10.00	8.50	9.50	8.00	9.50	8.00	9.50	8.00	9.50	8.00
	122	[redacted]		13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	138	[redacted]		13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
	155	[redacted]		13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
5 GHz WIFI 160 MHz Bandwidth	50	[redacted]		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	114	[redacted]		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Note: Targets for 802.11ax RU operations can be found in 802.11ax RU SAR Exclusion Appendix.

Mode	Channel	IEEE 802.11 (Maximum in dBm) - Antenna WF8													
		SISO	SISO	SISO	SISO	SISO	SISO	MIMO CDD	MIMO CDD	MIMO CDD	MIMO CDD	MIMO SDM	MIMO SDM	MIMO SDM	MIMO SDM
		a (Maximum)	a (Nominal)	n/ac (Maximum)	n/ac (Nominal)	ax SU (Maximum)	ax SU (Nominal)	n/ac (Maximum)	n/ac (Nominal)	ax SU (Maximum)	ax SU (Nominal)	n/ac (Maximum)	n/ac (Nominal)	ax SU (Maximum)	ax SU (Nominal)
5 GHz WIFI 20 MHz Bandwidth	36	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00
	40	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00
	44	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00
	48	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00
	52	16.50	15.00	16.50	15.00	16.50	15.00	15.50	14.00	16.00	14.50	16.50	15.00	16.50	15.00
	56	16.50	15.00	16.50	15.00	16.50	15.00	15.50	14.00	16.00	14.50	16.50	15.00	16.50	15.00
	60	16.50	15.00	16.50	15.00	16.50	15.00	15.50	14.00	16.00	14.50	16.50	15.00	16.50	15.00
	64	16.50	15.00	16.50	15.00	16.50	15.00	15.50	14.00	16.00	14.50	16.50	15.00	16.00	14.50
	100	16.50	15.00	16.50	15.00	15.50	14.00	15.50	14.00	15.00	13.50	16.50	15.00	15.00	13.50
	104	17.00	15.50	17.00	15.50	17.00	15.50	15.50	14.00	15.50	14.00	16.00	14.50	15.50	14.00
	108	17.00	15.50	17.00	15.50	17.00	15.50	15.50	14.00	16.00	14.50	17.00	15.50	17.00	15.50
	112	17.00	15.50	17.00	15.50	17.00	15.50	15.50	14.00	16.00	14.50	17.00	15.50	17.00	15.50
	116	17.00	15.50	17.00	15.50	17.00	15.50	15.50	14.00	16.00	14.50	17.00	15.50	17.00	15.50
	120	17.00	15.50	17.00	15.50	17.00	15.50	15.50	14.00	16.00	14.50	17.00	15.50	17.00	15.50
	124	17.00	15.50	17.00	15.50	17.00	15.50	15.50	14.00	16.00	14.50	17.00	15.50	17.00	15.50
	128	17.00	15.50	17.00	15.50	17.00	15.50	15.50	14.00	16.00	14.50	17.00	15.50	17.00	15.50
	132	17.00	15.50	17.00	15.50	17.00	15.50	15.50	14.00	16.00	14.50	17.00	15.50	17.00	15.50
	136	17.00	15.50	17.00	15.50	17.00	15.50	15.50	14.00	16.00	14.50	17.00	15.50	17.00	15.50
	140	16.00	14.50	16.00	14.50	15.50	14.00	15.00	13.50	15.00	13.50	15.00	13.50	14.50	13.00
	144	17.00	15.50	17.00	15.50	17.00	15.50	15.50	14.00	16.00	14.50	17.00	15.50	17.00	15.50
	149	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50
	153	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50
	157	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50
	161	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50
	165	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50
5 GHz WIFI 40 MHz Bandwidth	38	[redacted]		14.50	13.00	14.50	13.00	13.50	12.00	12.00	10.50	13.50	12.00	12.00	10.50
	46	[redacted]		16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00
	54	[redacted]		16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00
	62	[redacted]		13.50	12.00	13.00	11.50	13.00	11.50	12.50	11.00	13.00	11.50	12.50	11.00
	102	[redacted]		13.50	12.00	13.50	12.00	12.50	11.00	12.00	10.50	12.50	11.00	12.00	10.50
	110	[redacted]		17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
	118	[redacted]		17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
	126	[redacted]		17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
	134	[redacted]		17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
	142	[redacted]		17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
	151	[redacted]		18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50
	159	[redacted]		18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50	18.00	16.50
5 GHz WIFI 80 MHz Bandwidth	42	[redacted]		12.50	11.00	12.00	10.50	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00
	58	[redacted]		10.50	9.00	10.00	8.50	10.00	8.50	9.50	8.00	10.00	8.50	9.50	8.00
	106	[redacted]		10.50	9.00	10.00	8.50	9.50	8.00	9.50	8.00	9.50	8.00	9.50	8.00
	122	[redacted]		17.00	15.50	16.50	15.00	16.50	15.00	16.00	14.50	16.50	15.00	16.00	14.50
	138	[redacted]		17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
	155	[redacted]		16.50	15.00	16.50	15.00	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00
5 GHz WIFI 160 MHz Bandwidth	50	[redacted]		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	114	[redacted]		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Note: Targets for 802.11ax RU operations can be found in 802.11ax RU SAR Exclusion Appendix.

1.2.2 Bluetooth Maximum Output Power

Mode / Band		Modulated Average (ePA) Single Tx Chain (dBm) Antenna WF8	Modulated Average (iPA) Single Tx Chain (dBm) Antenna WF8
Bluetooth BDR	Maximum	**N/A**	**14.50**
	Nominal	**N/A**	**13.00**
Bluetooth EDR	Maximum	**N/A**	**11.50**
	Nominal	**N/A**	**10.00**
Bluetooth LE1M/2M	Maximum	**N/A**	**14.50**
	Nominal	**N/A**	**13.00**
Bluetooth HDR4	Maximum	**N/A**	**N/A**
	Nominal	**N/A**	**N/A**
Bluetooth HDR8	Maximum	**N/A**	**N/A**
	Nominal	**N/A**	**N/A**

Mode / Band		Modulated Average (ePA) Single Tx Chain (dBm) Antenna WF7b	Modulated Average (iPA) Single Tx Chain (dBm) Antenna WF7b
Bluetooth BDR	Maximum	**N/A**	**14.50**
	Nominal	**N/A**	**13.00**
Bluetooth EDR	Maximum	**N/A**	**11.50**
	Nominal	**N/A**	**10.00**
Bluetooth LE1M/2M	Maximum	**N/A**	**14.50**
	Nominal	**N/A**	**13.00**
Bluetooth HDR4	Maximum	**N/A**	**N/A**
	Nominal	**N/A**	**N/A**
Bluetooth HDR8	Maximum	**N/A**	**N/A**
	Nominal	**N/A**	**N/A**

1.3 DUT Antenna Locations

The overall diagonal dimension of the device is > 200 mm. A diagram showing the location of the device antennas can be found in DUT Antenna Diagram & SAR Test Setup Photographs Appendix. Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC filings.

Note: Per FCC KDB Publication 616217 D04v01r01, front side of the device is not required to be evaluated for SAR. All other edges were evaluated for simultaneous transmission analysis.

1.4 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D04v01, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds.

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D04v01 4.3.2 procedures.

Table 1-1
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Body
1	2.4 GHz Wi-Fi MIMO	Yes
2	5GHz Wi-Fi MIMO	Yes
3	2.4 Bluetooth Antenna WF7b + 2.4 GHz Wi-Fi Antenna WF8	Yes
4	2.4 GHz Bluetooth + 5 GHz Wi-Fi MIMO	Yes
5	2.4 GHz Bluetooth + 5 GHz Wi-Fi	Yes
6	2.4 GHz Wi-Fi + 5 GHz Wi-Fi	Yes

1. 2.4GHz WIFI and 2.4 GHz Bluetooth can transmit simultaneously on separate antennas. Specific 2.4 GHz WIFI Antenna that can only transmit simultaneously with 2.4 GHz Bluetooth is listed in the above table. In this scenario, Wi-Fi max power will not exceed minimum of (13.5 dBm, SAR max cap, Reg max cap) power. Additionally, in disconnected mode, BT will be using iPA only.
2. This device supports 2x2 MIMO Tx for WLAN 802.11a/b/g/n/ac/ax. 802.11a/b/g/n/ac/ax supports CDD and STBC and 802.11n/ac/ax additionally supports SDM. Each WLAN antenna can transmit independently or together when operating with MIMO.

1.5 Miscellaneous SAR Test Considerations

(A) WIFI/BT

Based on the maximum allowed power for the respective antennas, U-NII-1 was evaluated for Antenna WF7a and U-NII-2A was evaluated for Antenna WF8. Additional testing for U-NII-2A Antenna WF7a and for U-NII-1 Antenna WF8 SAR was not required since all reported SAR was less than 1.2 W/kg per FCC KDB Publication 248227 D01v02r02.

This device supports channel 1-13 for 2.4 GHz WLAN. However, because channel 12/13 targets are not higher than that of channels 1-11, channels 1, 6, and 11 were considered for SAR testing per FCC KDB 248227 D01V02r02.

This device supports IEEE 802.11ac with the following features:

a) Up to 80 MHz Bandwidth only for 5 GHz
b) 3 Tx antenna output
c) 256 QAM is supported
d) TDWR and Band gap channels are supported

This device supports IEEE 802.11ax with the following features:

a) Up to 80 MHz Bandwidth only for 5 GHz
b) Up to 20 MHz Bandwidth only for 2.4 GHz
c) No aggregate channel configurations
d) 3 Tx antenna output
e) Up to 1024 QAM is supported
f) TDWR and Band gap channels are supported for 5 GHz
g) MU-MIMO UL Operations are not supported

Per April 2019 TCB Workshop Notes, SAR testing was not required for 802.11ax when applying the initial test configuration procedures of KDB 248227, with 802.11ax considered a higher order 802.11 mode.

1.6 Guidance Applied

- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D04v01 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 616217 D04v01r02 (Tablet)
- November 2017, October 2018, April 2019, November 2019, October 2020 TCB Workshop Notes (IEEE 802.11ax)
- SPEAG DASY6 System Handbook
- SPEAG DASY6 Application Note (Interim Procedures for Devices Operating at 6-10 GHz) (Nov 2021)
- IEEE 1528-2013
- IEC TR 63170:2018
- IEC 62479:2010

1.7 Device Serial Numbers

Several samples with identical hardware were used to support SAR testing. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical, and thermal characteristics and are within operational tolerances expected for production units. The serial numbers used for each test are indicated alongside the results in Section 9.

2 INTRODUCTION

The FCC and Innovation, Science, and Economic Development Canada have adopted the guidelines for evaluating the environmental effects of radio frequency (RF) radiation in ET Docket 93-62 on Aug. 6, 1996 and Health Canada Safety Code 6 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. [1]

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [3] and Health Canada RF Exposure Guidelines Safety Code 6 [22]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [4] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

2.1 SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Equation 2-1).

Equation 2-1
SAR Mathematical Equation

$$SAR = \frac{d}{dt}\left(\frac{dU}{dm}\right) = \frac{d}{dt}\left(\frac{dU}{\rho dv}\right)$$

SAR is expressed in units of Watts per Kilogram (W/kg).

$$SAR = \frac{\sigma \cdot E^2}{\rho}$$

where:

σ = conductivity of the tissue-simulating material (S/m)
ρ = mass density of the tissue-simulating material (kg/m^3)
E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relation to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.[6]

3 DOSIMETRIC ASSESSMENT

3.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013:

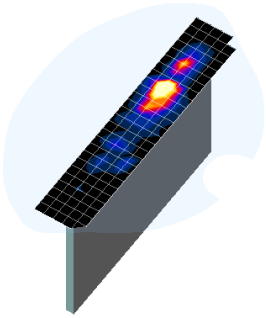

Figure 3-1
Sample SAR Area Scan

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface, and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 3-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 3-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):

   a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 3-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).

   b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.

   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

Table 3-1
Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04*

Frequency	Maximum Area Scan Resolution (mm) (Δx_{area}, Δy_{area})	Maximum Zoom Scan Resolution (mm) (Δx_{zoom}, Δy_{zoom})	Maximum Zoom Scan Spatial Resolution (mm)			Minimum Zoom Scan Volume (mm) (x,y,z)
			Uniform Grid	Graded Grid		
			$\Delta z_{zoom}(n)$	$\Delta z_{zoom}(1)$*	$\Delta z_{zoom}(n>1)$*	
≤ 2 GHz	≤ 15	≤ 8	≤ 5	≤ 4	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 30
2-3 GHz	≤ 12	≤ 5	≤ 5	≤ 4	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 30
3-4 GHz	≤ 12	≤ 5	≤ 4	≤ 3	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 28
4-5 GHz	≤ 10	≤ 4	≤ 3	≤ 2.5	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 25
5-6 GHz	≤ 10	≤ 4	≤ 2	≤ 2	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 22

*Also compliant to IEEE 1528-2013 Table 6

4 TEST CONFIGURATION POSITIONS

4.1 Device Holder

The device holder is made out of low-loss POM material having the following dielectric parameters: relative permittivity ε = 3 and loss tangent δ = 0.02.

4.2 SAR Testing for Tablet per KDB Publication 616217 D04v01r02

Per FCC KDB Publication 616217 D04v01r02, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR Exclusion Threshold in KDB 447498 D04v01 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

5 RF EXPOSURE LIMITS

5.1 Uncontrolled Environment

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

5.2 Controlled Environment

CONTROLLED ENVIRONMENTS are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

5.3 RF Exposure Limits for Frequencies below 6 GHz

Table 5-1
SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT *General Population* (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT *Occupational* (W/kg) or (mW/g)
Peak Spatial Average SAR Head	1.6	8.0
Whole Body SAR	0.08	0.4
Peak Spatial Average SAR Hands, Feet, Ankle, Wrists, etc.	4.0	20

1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The Spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

5.4 RF Exposure Limits for Frequencies above 6 GHz

Per §1.1310 (d)(3), the MPE limits are applied for frequencies above 6 GHz. Power Density is expressed in units of W/m^2 or mW/cm^2.

Peak Spatially Averaged Power Density was evaluated over a circular area of 4 cm^2 per interim FCC Guidance for near-field power density evaluations per October 2018 TCB Workshop notes.

Table 5-2
Human Exposure Limits Specified in FCC 47 CFR §1.1310

Human Exposure to Radiofrequency (RF) Radiation Limits		
Frequency Range [MHz]	**Power Density** [mW/cm^2]	**Average Time** [Minutes]
(A) Limits For Occupational / Controlled Environments		
1,500 – 100,000	5.0	6
(B) Limits For General Population / Uncontrolled Environments		
1,500 – 100,000	1.0	30

Note: 1.0 mW/cm^2 is 10 W/m^2

6 FCC MEASUREMENT PROCEDURES

Power measurements for licensed transmitters are performed using a base station simulator under digital average power.

6.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D04v01, when SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as *reported* SAR. The highest *reported* SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

6.2 SAR Testing with 802.11 Transmitters

The normal network operating configurations of 802.11 transmitters are not suitable for SAR measurements. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset-based test mode software to ensure the results are consistent and reliable. See KDB Publication 248227 D01v02r02 for more details.

6.2.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters.

A periodic duty factor is required for current generation SAR systems to measure SAR. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR is scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

6.2.2 U-NII-1 and U-NII-2A

For devices that operate in both U-NII-1 and U-NII-2A bands, when the same maximum output power is specified for both bands, SAR measurement using OFDM SAR test procedures is not required for U-NII-1 unless the highest reported SAR for U-NII-2A is > 1.2 W/kg. When different maximum output powers are specified for the bands, SAR measurement for the U-NII band with the lower maximum output power is not required unless the highest reported SAR for the U-NII band with the higher maximum output power, adjusted by the ratio of lower to higher specified maximum output power for the two bands, is > 1.2 W/kg. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

6.2.3 U-NII-2C and U-NII-3

The frequency range covered by U-NII-2C and U-NII-3 is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. When Terminal Doppler Weather Radar (TDWR) restriction applies, the channels at 5.60 – 5.65 GHz in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification. Unless band gap channels are permanently disabled, SAR must be considered for these channels. Each band is

tested independently according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

6.2.4 2.4 GHz SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either the fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.

2) When the reported SAR is > 0.8 W/kg, SAR is required for that position using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel, i.e., all channels require testing.

2.4 GHz 802.11 g/n/ax OFDM are additionally evaluated for SAR if the highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is > 1.2 W/kg. When SAR is required for OFDM modes in 2.4 GHz band, the Initial Test Configuration Procedures should be followed. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

6.2.5 OFDM Transmission Mode and SAR Test Channel Selection

When the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations; for example, 802.11a, 802.11n and 802.11ac or 802.11g and 802.11n with the same channel bandwidth, modulation and data rate etc., the lower order 802.11 mode i.e., 802.11a, then 802.11n and 802.11ac or 802.11g then 802.11n, is used for SAR measurement. Per April 2019 TCB Workshop guidance, 802.11ax was considered the highest order 802.11 mode. When the maximum output power are the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

6.2.6 Initial Test Configuration Procedure

For OFDM, an initial test configuration is determined for each frequency band and aggregated band, according to the transmission mode with the highest maximum output power specified for SAR measurements. When the same maximum output power is specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration(s) with the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order IEEE 802.11 mode. The channel of the transmission mode with the highest average RF output conducted power will be the initial test configuration.

When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurements (See Section 6.2.5). When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

6.2.7 Subsequent Test Configuration Procedures

For OFDM configurations in each frequency band and aggregated band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position procedure. When the highest reported SAR (for the initial test configuration), adjusted by the ratio of the specified maximum output power of the subsequent test configuration to initial test configuration, is ≤ 1.2 W/kg, no additional SAR tests for the subsequent test configurations are required. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

6.2.8 MIMO SAR considerations

Per KDB Publication 248227 D01v02r02, the simultaneous SAR provisions in KDB Publication 447498 D04v01 should be applied to determine simultaneous transmission SAR test exclusion for WIFI MIMO. If the sum of 1g single transmission chain SAR measurements is <1.6 W/kg, no additional SAR measurements for MIMO are required. Alternatively, SAR for MIMO can be measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

7 RF CONDUCTED POWERS

7.1 2.4 GHz WLAN Maximum Time-Averaged Conducted Powers

Table 7-1
2.4 GHz WLAN Maximum Average RF Power – Antenna WF7b

2.4GHz WIFI (20MHz 802.11b SISO ANTWF7b)			
Freq. [MHz]	**Channel**	**Detector**	**Conducted Power [dBm]**
2412	1	Average	18.62
2437	6		18.65
2462	11		18.75
2.4GHz WIFI (20MHz 802.11g SISO ANTWF7b)			
Freq. [MHz]	**Channel**	**Detector**	**Conducted Power [dBm]**
2412	1	Average	14.55
2437	6		18.12
2462	11		14.19
2.4GHz WIFI (20MHz 802.11n SISO ANTWF7b)			
Freq. [MHz]	**Channel**	**Detector**	**Conducted Power [dBm]**
2412	1	Average	14.59
2437	6		17.57
2462	11		14.02
2.4GHz WIFI (20MHz 802.11ax SISO ANTWF7b)			
Freq. [MHz]	**Channel**	**Detector**	**Conducted Power [dBm]**
2412	1	Average	14.50
2437	6		17.53
2462	11		13.59

Table 7-2
2.4 GHz WLAN Maximum Average RF Power – Antenna WF8

2.4GHz WIFI (20MHz 802.11b SISO ANTWF8)			
Freq. [MHz]	**Channel**	**Detector**	**Conducted Power [dBm]**
2412	1	Average	19.38
2437	6		19.30
2462	11		19.32
2.4GHz WIFI (20MHz 802.11g SISO ANTWF8)			
Freq. [MHz]	**Channel**	**Detector**	**Conducted Power [dBm]**
2412	1	Average	14.79
2437	6		18.25
2462	11		14.21

2.4GHz WIFI (20MHz 802.11n SISO ANTWF8)			
Freq. [MHz]	**Channel**	**Detector**	**Conducted Power [dBm]**
2412	1	Average	14.78
2437	6		17.79
2462	11		14.25
2.4GHz WIFI (20MHz 802.11ax SISO ANTWF8)			
Freq. [MHz]	**Channel**	**Detector**	**Conducted Power [dBm]**
2412	1	Average	14.81
2437	6		17.81
2462	11		13.75

7.2 5 GHz WLAN Maximum Time-Averaged Conducted Powers

Table 7-3
5 GHz WLAN Maximum Average RF Power – Antenna WF7a

5GHz WIFI (40MHz 802.11n SISO ANTWF7a)			
Band	**Freq. [MHz]**	**Channel**	**Avg. Conducted Power [dBm]**
UNII-1	5190	38	13.05
	5230	46	14.60
UNII-2A	5270	54	13.80
	5310	62	11.80
5GHz WIFI (80MHz 802.11ac SISO ANTWF7a)			
Band	**Freq. [MHz]**	**Channel**	**Avg. Conducted Power [dBm]**
UNII-2C	5530	106	9.65
	5610	122	12.77
	5690	138	13.01
UNII-3	5775	155	12.69
5GHz WIFI (40MHz 802.11ac SISO ANTWF7a)			
Band	**Freq. [MHz]**	**Channel**	**Avg. Conducted Power [dBm]**
UNII-1	5190	38	13.55
	5230	46	14.45
UNII-2A	5270	54	13.92
	5310	62	12.45
5GHz WIFI (40MHz 802.11ax SISO ANTWF7a)			
Band	**Freq. [MHz]**	**Channel**	**Avg. Conducted Power [dBm]**
UNII-1	5190	38	13.61
	5230	46	14.37
UNII-2A	5270	54	13.89
	5310	62	11.93
5GHz WIFI (80MHz 802.11ax SISO ANTWF7a)			
Band	**Freq. [MHz]**	**Channel**	**Avg. Conducted Power [dBm]**
UNII-2C	5530	106	8.95
	5610	122	12.49
	5690	138	12.52
UNII-3	5775	155	12.67

Table 7-4
5 GHz WLAN Maximum Average RF Power – Antenna WF8

5GHz WIFI (40MHz 802.11n SISO ANTWF8)			
Band	**Freq. [MHz]**	**Channel**	**Avg. Conducted Power [dBm]**
UNII-1	5190	38	12.82
	5230	46	16.49
UNII-2A	5270	54	15.76
	5310	62	11.86
UNII-3	5755	151	16.53
	5795	159	16.70
5GHz WIFI (80MHz 802.11ac SISO ANT WF8)			
Band	**Freq. [MHz]**	**Channel**	**Avg. Conducted Power [dBm]**
UNII-2C	5530	106	9.55
	5610	122	16.15
	5690	138	16.40
5GHz WIFI (40MHz 802.11ac SISO ANTWF8)			
Band	**Freq. [MHz]**	**Channel**	**Avg. Conducted Power [dBm]**
UNII-1	5190	38	13.75
	5230	46	15.71
UNII-2A	5270	54	15.56
	5310	62	12.85
UNII-3	5755	151	17.27
	5795	159	17.23
5GHz WIFI (40MHz 802.11ax SISO ANTWF8)			
Band	**Freq. [MHz]**	**Channel**	**Avg. Conducted Power [dBm]**
UNII-1	5190	38	13.76
	5230	46	15.63
UNII-2A	5270	54	15.53
	5310	62	12.28
UNII-3	5755	151	17.23
	5795	159	17.12
5GHz WIFI (80MHz 802.11ax SISO ANTWF8)			
Band	**Freq. [MHz]**	**Channel**	**Avg. Conducted Power [dBm]**
UNII-2C	5530	106	9.21
	5610	122	15.35
	5690	138	16.12

Table 7-5
5 GHz WLAN Maximum Average RF Power – Antenna WF8 and WF7a MIMO

5GHz WIFI (40MHz 802.11n MIMO)					
Band	**Freq [MHz]**	**Channel**	**Avg. Conducted Powers [dBm]**		
			ANT WF7a	**ANT WF8**	**MIMO**
UNII-1	5190	38	12.31	12.09	15.21
	5230	46	14.37	15.36	17.90
UNII-2A	5270	54	14.34	15.36	17.89
	5310	62	11.91	11.92	14.93
UNII-3	5755	151	12.45	16.94	18.26
	5795	159	12.39	16.77	18.12
5GHz WIFI (80MHz 802.11ac MIMO)					
Band	**Freq [MHz]**	**Channel**	**Avg. Conducted Powers [dBm]**		
			ANT WF7a	**ANT WF8**	**MIMO**
UNII-2C	5530	106	8.32	8.20	11.27
	5610	122	12.79	15.23	17.19
	5690	138	12.78	15.76	17.53

7.3 Notes for WLAN

Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02:

- Power measurements were performed for the transmission mode configuration with the highest maximum output power specified for production units.
- For transmission modes with the same maximum output power specification, powers were measured for the largest channel bandwidth, lowest order modulation and lowest data rate.
- For transmission modes with identical maximum specified output power, channel bandwidth, modulation and data rates, power measurements were required for all identical configurations.
- For each transmission mode configuration, powers were measured for the highest and lowest channels; and at the mid-band channel(s) when there were at least 3 channels supported. For configurations with multiple mid-band channels, due to an even number of channels, both channels were measured.

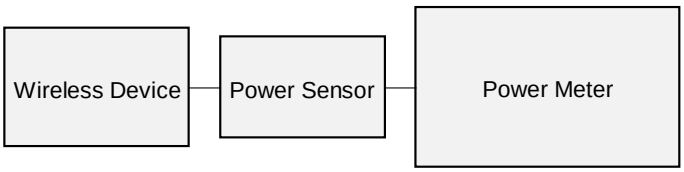

Figure 7-1
Power Measurement Setup

7.4 Bluetooth Maximum Conducted Powers

Table 7-2
Bluetooth Average RF Power – Antenna WF7b

Frequency [MHz]	Modulation	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2402	GFSK	1.0	0	12.60	18.197
2441	GFSK	1.0	39	12.64	18.365
2480	GFSK	1.0	78	12.70	18.621

Table 7-3
Bluetooth Average RF Power – Antenna WF8

Frequency [MHz]	Modulation	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2402	GFSK	1.0	0	12.82	19.143
2441	GFSK	1.0	39	12.80	19.055
2480	GFSK	1.0	78	12.69	18.578

7.5 Bluetooth Duty Cycle Plots

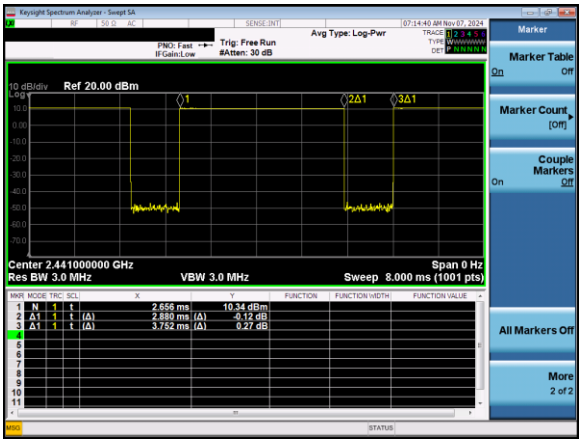

Figure 7-2
Bluetooth Transmission Plot – Antenna WF7b

Equation 7-1
Bluetooth Duty Cycle Calculation – Antenna WF7b

$$Duty\ Cycle = \frac{Pulse\ Width}{Period} * 100\% = \frac{2.880\ ms}{3.752\ ms} * 100\% = 76.76\%$$

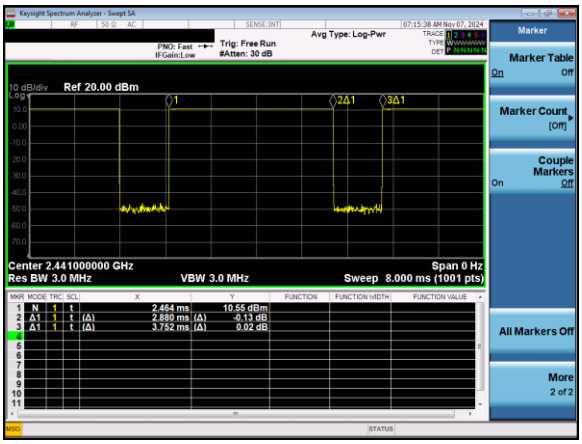

Figure 7-3
Bluetooth Transmission Plot – Antenna WF8

Equation 7-2
Bluetooth Duty Cycle Calculation – Antenna WF8

$$Duty\ Cycle = \frac{Pulse\ Width}{Period} * 100\% = \frac{2.880\ ms}{3.752\ ms} * 100\% = 76.76\%$$

7.6 Notes for Bluetooth

- Full power measurements were performed per FCC KDB Procedures 248227.

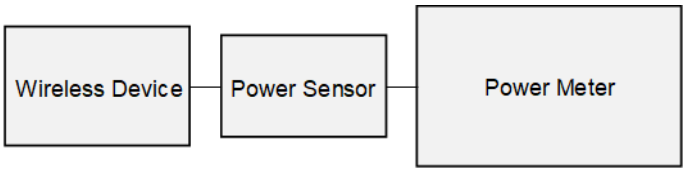

Figure 7-4
Power Measurement Setup

8 SYSTEM VERIFICATION

8.1 Tissue Verification

Table 8-1
Measured Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	% dev σ	% dev ε
11/21/2024	2450 Head	19.2	2300	1.709	38.567	1.670	39.500	2.32%	-2.36%
			2310	1.717	38.554	1.679	39.480	2.28%	-2.35%
			2320	1.725	38.540	1.687	39.460	2.28%	-2.33%
			2400	1.784	38.431	1.756	39.289	1.58%	-2.18%
			2450	1.826	38.359	1.800	39.200	1.42%	-2.15%
			2480	1.849	38.311	1.833	39.162	0.90%	-2.17%
			2500	1.864	38.281	1.855	39.136	0.50%	-2.18%
			2510	1.871	38.265	1.866	39.123	0.27%	-2.19%
			2535	1.892	38.233	1.893	39.092	-0.07%	-2.20%
			2550	1.905	38.204	1.909	39.073	-0.22%	-2.22%
			2560	1.914	38.183	1.920	39.060	-0.32%	-2.25%
			2600	1.945	38.107	1.964	39.009	-0.96%	-2.31%
			2650	1.983	38.004	2.018	38.945	-1.74%	-2.42%
			2680	2.011	37.935	2.051	38.907	-1.96%	-2.50%
			2700	2.028	37.908	2.073	38.882	-2.19%	-2.50%
12/08/2024	2450 Head	19.9	2300	1.682	37.956	1.670	39.500	0.71%	-3.91%
			2310	1.690	37.943	1.679	39.480	0.64%	-3.89%
			2320	1.697	37.926	1.687	39.460	0.59%	-3.89%
			2400	1.755	37.805	1.756	39.289	-0.07%	-3.78%
			2450	1.791	37.745	1.800	39.200	-0.50%	-3.71%
			2480	1.813	37.685	1.833	39.162	-1.10%	-3.77%
			2500	1.830	37.657	1.855	39.136	-1.36%	-3.78%
			2510	1.838	37.645	1.866	39.123	-1.52%	-3.78%
			2535	1.857	37.612	1.893	39.092	-1.93%	-3.79%
			2550	1.868	37.595	1.909	39.073	-2.15%	-3.78%
			2560	1.876	37.580	1.920	39.060	-2.31%	-3.79%
			2600	1.910	37.505	1.964	39.009	-2.77%	-3.86%
			2650	1.950	37.424	2.018	38.945	-3.36%	-3.91%
			2680	1.973	37.374	2.051	38.907	-3.82%	-3.94%
			2700	1.990	37.329	2.073	38.882	-4.01%	-3.99%
11/14/2024	5200-5800 Head	19.7	5150	4.611	34.890	4.608	36.050	0.07%	-3.22%
			5160	4.624	34.874	4.618	36.040	0.13%	-3.24%
			5170	4.641	34.852	4.629	36.030	0.26%	-3.27%
			5180	4.652	34.821	4.635	36.009	0.37%	-3.30%
			5190	4.662	34.792	4.645	35.998	0.37%	-3.35%
			5200	4.674	34.788	4.655	35.986	0.41%	-3.33%
			5210	4.686	34.787	4.666	35.975	0.43%	-3.30%
			5220	4.695	34.775	4.676	35.963	0.41%	-3.30%
			5240	4.713	34.708	4.696	35.940	0.36%	-3.43%
			5250	4.725	34.696	4.706	35.929	0.40%	-3.43%
			5260	4.735	34.687	4.717	35.917	0.38%	-3.42%
			5270	4.744	34.678	4.727	35.906	0.36%	-3.42%
			5280	4.757	34.660	4.737	35.894	0.42%	-3.44%
			5290	4.769	34.626	4.748	35.883	0.44%	-3.50%
			5300	4.782	34.598	4.758	35.871	0.50%	-3.55%
			5310	4.790	34.576	4.768	35.860	0.46%	-3.58%
			5320	4.798	34.571	4.778	35.849	0.42%	-3.56%
			5500	4.993	34.263	4.963	35.643	0.60%	-3.87%
			5510	5.004	34.248	4.973	35.632	0.62%	-3.88%
			5520	5.015	34.233	4.983	35.620	0.64%	-3.89%
			5530	5.024	34.215	4.994	35.609	0.60%	-3.91%
			5540	5.035	34.197	5.004	35.597	0.62%	-3.93%
			5550	5.049	34.180	5.014	35.586	0.70%	-3.95%
			5560	5.058	34.159	5.024	35.574	0.68%	-3.98%
			5580	5.073	34.141	5.045	35.551	0.58%	-3.97%
			5600	5.106	34.093	5.065	35.529	0.81%	-4.04%
			5610	5.116	34.075	5.076	35.518	0.79%	-4.06%
			5620	5.126	34.063	5.086	35.506	0.79%	-4.06%
			5640	5.155	34.024	5.106	35.483	0.96%	-4.11%
			5660	5.170	33.976	5.127	35.460	0.84%	-4.18%
			5680	5.185	33.969	5.147	35.437	0.74%	-4.14%
			5690	5.199	33.942	5.158	35.426	0.79%	-4.19%
			5700	5.216	33.913	5.168	35.414	0.93%	-4.24%
			5710	5.229	33.895	5.178	35.403	0.98%	-4.26%
			5720	5.239	33.890	5.188	35.391	0.98%	-4.24%
			5745	5.266	33.845	5.214	35.363	1.00%	-4.29%
			5750	5.272	33.836	5.219	35.357	1.02%	-4.30%
			5755	5.276	33.830	5.224	35.351	1.00%	-4.30%
			5765	5.285	33.818	5.234	35.340	0.97%	-4.31%
			5775	5.298	33.806	5.245	35.329	1.01%	-4.31%
			5785	5.309	33.780	5.255	35.317	1.03%	-4.35%
			5795	5.319	33.755	5.265	35.305	1.03%	-4.39%
			5800	5.323	33.747	5.270	35.300	1.01%	-4.40%
			5805	5.327	33.742	5.275	35.294	0.99%	-4.40%
			5825	5.352	33.714	5.296	35.271	1.06%	-4.41%
			5835	5.364	33.704	5.305	35.230	1.11%	-4.33%
			5845	5.376	33.692	5.315	35.210	1.15%	-4.31%
			5850	5.381	33.689	5.320	35.200	1.15%	-4.29%
			5855	5.388	33.682	5.325	35.197	1.18%	-4.30%
			5865	5.395	33.662	5.336	35.190	1.11%	-4.34%
			5875	5.407	33.632	5.347	35.183	1.12%	-4.41%
			5885	5.417	33.607	5.357	35.177	1.12%	-4.46%
			5905	5.437	33.568	5.379	35.163	1.08%	-4.54%

The above measured tissue parameters were used in the DASY software. The DASY software was used to perform interpolation to determine the dielectric parameters at the SAR test device frequencies (per KDB Publication 865664 D01v01r04 and IEEE 1528-2013 6.6.1.2). The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

Note: Per April 2019 TCB Workshop Notes, single head-tissue simulating liquid specified in IEC 62209-1 is permitted to use for all SAR tests.

8.2 Test System Verification

Prior to SAR assessment, the system is verified to ±10% of the SAR measurement on the reference dipole at the time of calibration by the calibration facility. Full system validation status and result summary can be found in the SAR System Validation Appendix.

Table 8-2
System Verification Results

SAR System	Tissue Frequency (MHz)	Tissue Type	Date	Amb. Temp. (C)	Liquid Temp. (C)	Input Power (W)	Source SN	Probe SN	DAE	Measured SAR 1g (W/kg)	1W Target SAR 1g (W/kg)	1W Normalized SAR 1g (W/kg)	Deviation 1g (%)
AM6	2450	HEAD	11/21/2024	20.6	20.5	0.10	750	7639	1403	5.610	52.600	56.100	6.65%
AM1	2450	HEAD	12/08/2024	21.6	20.2	0.10	750	7416	701	5.310	52.600	53.100	0.95%
AM8	5250	HEAD	11/14/2024	21.1	19.1	0.05	1123	7427	467	3.810	79.400	76.200	-4.03%
AM8	5600	HEAD	11/14/2024	21.1	19.1	0.05	1123	7427	467	4.030	82.500	80.600	-2.30%
AM8	5750	HEAD	11/14/2024	21.1	19.1	0.05	1123	7427	467	3.690	79.400	73.800	-7.05%
AM8	5850	HEAD	11/14/2024	21.1	19.1	0.05	1123	7427	467	4.050	80.100	81.000	1.12%

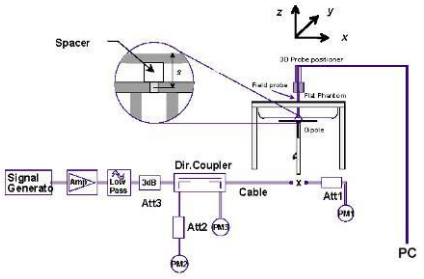

Figure 8-1
System Verification Setup Diagram

Figure 8-2
System Verification Setup Photo

9 SAR DATA SUMMARY

9.1 2.4 GHz WIFI SISO Standalone SAR

Table 9-1 Antenna WF7b

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Measured 10g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported 10g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF7b	G3GV1	92.88	-0.01	2462	11	1	19.50	18.75	Back	0	0.186	0.093	1.189	1.077	0.238	0.119	0.149	
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF7b	G3GV1	92.88	0.00	2412	1	1	19.50	18.62	Top	0	0.783	0.364	1.225	1.077	1.033	0.480	0.646	
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF7b	G3GV1	92.88	-0.01	2437	6	1	19.50	18.65	Top	0	0.881	0.404	1.216	1.077	1.154	0.529	0.721	
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF7b	G3GV1	92.88	0.00	2462	11	1	19.50	18.75	Top	0	0.929	0.420	1.189	1.077	1.190	0.538	0.744	
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF7b	G3GV1	92.88	0.03	2462	11	1	19.50	18.75	Bottom	0	0.006	0.002	1.189	1.077	0.008	0.003	0.005	
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF7b	G3GV1	92.88	0.04	2462	11	1	19.50	18.75	Right	0	0.020	0.010	1.189	1.077	0.026	0.013	0.016	
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF7b	G3GV1	92.88	-0.02	2412	1	1	19.50	18.62	Left	0	0.779	0.354	1.225	1.077	1.028	0.467	0.643	
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF7b	G3GV1	92.88	-0.03	2437	6	1	19.50	18.65	Left	0	0.834	0.376	1.216	1.077	1.092	0.492	0.683	
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF7b	G3GV1	92.88	0.01	2462	11	1	19.50	18.75	Left	0	0.833	0.374	1.189	1.077	1.067	0.479	0.667	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram									

Table 9-2 Antenna WF8

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Measured 10g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported 10g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF8	G3GV1	92.88	0.03	2412	1	1	20.00	19.38	Back	0	0.089	0.045	1.153	1.077	0.111	0.056	0.069	
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF8	G3GV1	92.88	0.07	2412	1	1	20.00	19.38	Top	0	0.832	0.359	1.153	1.077	1.033	0.446	0.646	
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF8	G3GV1	92.88	0.06	2437	6	1	20.00	19.30	Top	0	0.906	0.386	1.175	1.077	1.147	0.488	0.717	
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF8	G3GV1	92.88	0.01	2462	11	1	20.00	19.13	Top	0	0.943	0.399	1.169	1.077	1.187	0.502	0.742	
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF8	G3GV1	92.88	-0.01	2462	11	1	20.00	19.32	Top	0	0.947	0.400	1.169	1.077	1.192	0.504	0.745	A1
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF8	G3GV1	92.88	0.08	2412	1	1	20.00	19.38	Bottom	0	0.002	0.000	1.153	1.077	0.002	0.000	0.001	
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF8	G3GV1	92.88	0.01	2412	1	1	20.00	19.38	Right	0	0.013	0.007	1.153	1.077	0.016	0.009	0.010	
Body	2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF8	G3GV1	92.88	0.00	2412	1	1	20.00	19.38	Left	0	0.000	0.000	1.153	1.077	0.000	0.000	0.000	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram									

Note: Blue entry represents variability measurement

9.2 5 GHz WIFI SISO Standalone SAR

Table 9-3 U-NII-1 Antenna WF7a

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	U-NII band	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Measured 10g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported 10g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #
Body	5 GHz WIFI/ IEEE 802.11n	40	OFDM	WF7a	N7Y3D	98.71	-0.20	5230	46	U-NII-1	13.5	15.50	14.60	Back	0	0.074	0.029	1.230	1.013	0.092	0.036	0.058	
Body	5 GHz WIFI/ IEEE 802.11n	40	OFDM	WF7a	N7Y3D	98.71	-0.09	5190	38	U-NII-1	13.5	14.50	13.05	Top	0	0.657	0.214	1.396	1.013	0.929	0.303	0.581	
Body	5 GHz WIFI/ IEEE 802.11n	40	OFDM	WF7a	N7Y3D	98.71	-0.06	5230	46	U-NII-1	13.5	15.50	14.60	Top	0	0.954	0.308	1.230	1.013	1.189	0.384	0.743	
Body	5 GHz WIFI/ IEEE 802.11n	40	OFDM	WF7a	N7Y3D	98.71	0.01	5230	46	U-NII-1	13.5	15.50	14.60	Bottom	0	0.006	0.000	1.230	1.013	0.007	0.000	0.004	
Body	5 GHz WIFI/ IEEE 802.11n	40	OFDM	WF7a	N7Y3D	98.71	0.06	5230	46	U-NII-1	13.5	15.50	14.60	Right	0	0.000	0.000	1.230	1.013	0.000	0.000	0.000	
Body	5 GHz WIFI/ IEEE 802.11n	40	OFDM	WF7a	N7Y3D	98.71	0.01	5230	46	U-NII-1	13.5	15.50	14.60	Left	0	0.005	0.000	1.230	1.013	0.006	0.000	0.004	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Body 1.6 W/kg (mW/g) averaged over 1 gram									

Table 9-4 U-NII-2C Antenna WF7a

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	U-NII band	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Measured 10g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported 10g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #
Body	5 GHz WIFI/ IEEE 802.11ac	80	OFDM	WF7a	XMW1Q	98.85	0.07	5690	138	U-NII-2C	29.3	13.50	13.01	Back	0	0.087	0.032	1.119	1.012	0.099	0.036	0.062	
Body	5 GHz WIFI/ IEEE 802.11ac	80	OFDM	WF7a	XMW1Q	98.85	-0.11	5530	106	U-NII-2C	29.3	10.50	9.65	Top	0	0.396	0.122	1.216	1.012	0.487	0.150	0.304	
Body	5 GHz WIFI/ IEEE 802.11ac	80	OFDM	WF7a	XMW1Q	98.85	0.02	5610	122	U-NII-2C	29.3	13.50	12.77	Top	0	0.569	0.201	1.183	1.012	1.136	0.360	0.710	
Body	5 GHz WIFI/ IEEE 802.11ac	80	OFDM	WF7a	XMW1Q	98.85	-0.02	5610	122	U-NII-2C	29.3	13.50	12.77	Top	0	0.993	0.312	1.183	1.012	1.189	0.374	0.743	A2
Body	5 GHz WIFI/ IEEE 802.11ac	80	OFDM	WF7a	XMW1Q	98.85	-0.07	5690	138	U-NII-2C	29.3	13.50	13.01	Top	0	0.879	0.274	1.119	1.012	0.995	0.310	0.622	
Body	5 GHz WIFI/ IEEE 802.11ac	80	OFDM	WF7a	XMW1Q	98.85	0.01	5690	138	U-NII-2C	29.3	13.50	13.01	Bottom	0	0.001	0.000	1.119	1.012	0.001	0.000	0.001	
Body	5 GHz WIFI/ IEEE 802.11ac	80	OFDM	WF7a	XMW1Q	98.85	0.04	5690	138	U-NII-2C	29.3	13.50	13.01	Right	0	0.000	0.000	1.119	1.012	0.000	0.000	0.000	
Body	5 GHz WIFI/ IEEE 802.11ac	80	OFDM	WF7a	XMW1Q	98.85	0.04	5690	138	U-NII-2C	29.3	13.50	13.01	Left	0	0.000	0.000	1.119	1.012	0.000	0.000	0.000	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Body 1.6 W/kg (mW/g) averaged over 1 gram									

Note: Blue entry represents variability measurement

Table 9-5 U-NII-3 Antenna WF7a

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	U-NII band	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Measured 10g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported 10g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF7a	VTXYK	98.85	-0.14	5775	155	U-NII-3	29.3	13.50	12.69	Back	0	0.082	0.034	1.205	1.012	0.100	0.041	0.063	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF7a	VTXYK	98.85	-0.02	5775	155	U-NII-3	29.3	13.50	12.69	Top	0	0.973	0.399	1.205	1.012	1.187	0.365	0.742	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF7a	VTXYK	98.85	0.01	5775	155	U-NII-3	29.3	13.50	12.69	Top	0	0.973	0.300	1.205	1.012	1.187	0.366	0.742	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF7a	VTXYK	98.85	0.05	5775	155	U-NII-3	29.3	13.50	12.69	Bottom	0	0.005	0.000	1.205	1.012	0.006	0.000	0.004	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF7a	VTXYK	98.85	0.03	5775	155	U-NII-3	29.3	13.50	12.69	Right	0	0.000	0.000	1.205	1.012	0.000	0.000	0.000	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF7a	VTXYK	98.85	0.01	5775	155	U-NII-3	29.3	13.50	12.69	Left	0	0.002	0.000	1.205	1.012	0.002	0.000	0.001	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Body 1.6 W/kg (mW/g) averaged over 1 gram									

Note: Blue entry represents variability measurement

Table 9-6 U-NII-2A Antenna WF8

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	U-NII band	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Measured 10g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported 10g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	6MMV2	98.71	0.04	5270	54	U-NII-2A	13.5	16.50	15.76	Back	0	0.082	0.034	1.186	1.013	0.099	0.041	0.062	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	6MMV2	98.71	-0.04	5270	54	U-NII-2A	13.5	16.50	15.76	Top	0	0.991	0.324	1.186	1.013	1.191	0.389	0.744	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	6MMV2	98.71	0.03	5270	54	U-NII-2A	13.5	16.50	15.76	Top	0	0.991	0.326	1.186	1.013	1.177	0.368	0.704	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	6MMV2	98.71	-0.10	5310	62	U-NII-2A	13.5	13.50	11.86	Top	0	0.342	0.107	1.459	1.013	0.505	0.158	0.316	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	6MMV2	98.71	0.04	5270	54	U-NII-2A	13.5	16.50	15.76	Bottom	0	0.016	0.005	1.186	1.013	0.019	0.006	0.012	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	6MMV2	98.71	-0.15	5270	54	U-NII-2A	13.5	16.50	15.76	Right	0	0.023	0.007	1.186	1.013	0.028	0.008	0.018	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	6MMV2	98.71	0.01	5270	54	U-NII-2A	13.5	16.50	15.76	Left	0	0.000	0.000	1.186	1.013	0.000	0.000	0.000	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Body 1.6 W/kg (mW/g) averaged over 1 gram									

Note: Blue entry represents variability measurement

Table 9-7 U-NII-2C Antenna WF8

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	U-NII band	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Measured 10g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported 10g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF8	WYHGM	98.85	-0.06	5690	138	U-NII-2C	29.3	17.00	16.40	Back	0	0.038	0.014	1.148	1.012	0.044	0.016	0.028	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF8	WYHGM	98.85	0.13	5530	106	U-NII-2C	29.3	10.50	9.55	Top	0	0.186	0.054	1.245	1.012	0.234	0.068	0.146	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF8	WYHGM	98.85	-0.05	5610	122	U-NII-2C	29.3	17.00	16.15	Top	0	0.919	0.295	1.216	1.012	1.131	0.363	0.707	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF8	WYHGM	98.85	-0.08	5690	138	U-NII-2C	29.3	17.00	16.40	Top	0	0.807	0.250	1.148	1.012	0.938	0.290	0.586	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF8	WYHGM	98.85	0.01	5690	138	U-NII-2C	29.3	17.00	16.40	Bottom	0	0.012	0.004	1.148	1.012	0.014	0.005	0.009	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF8	WYHGM	98.85	0.07	5690	138	U-NII-2C	29.3	17.00	16.40	Right	0	0.018	0.005	1.148	1.012	0.021	0.006	0.013	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF8	WYHGM	98.85	0.01	5690	138	U-NII-2C	29.3	17.00	16.40	Left	0	0.000	0.000	1.148	1.012	0.000	0.000	0.000	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Body 1.6 W/kg (mW/g) averaged over 1 gram									

Table 9-8 U-NII-3 Antenna WF8

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	U-NII band	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Measured 10g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported 10g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	P1475	98.71	0.15	5795	159	U-NII-3	13.5	18.00	16.70	Back	0	0.050	0.019	1.349	1.013	0.068	0.026	0.043	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	P1475	98.71	0.04	5755	151	U-NII-3	13.5	18.00	16.53	Top	0	0.834	0.246	1.403	1.013	1.185	0.350	0.741	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	P1475	98.71	-0.02	5795	159	U-NII-3	13.5	18.00	16.70	Top	0	0.774	0.230	1.349	1.013	1.058	0.314	0.661	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	P1475	98.71	0.04	5795	159	U-NII-3	13.5	18.00	16.70	Bottom	0	0.018	0.002	1.349	1.013	0.025	0.003	0.016	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	P1475	98.71	0.09	5795	159	U-NII-3	13.5	18.00	16.70	Right	0	0.022	0.006	1.349	1.013	0.030	0.008	0.019	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	P1475	98.71	0.01	5795	159	U-NII-3	13.5	18.00	16.70	Left	0	0.003	0.000	1.349	1.013	0.004	0.000	0.003	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Body 1.6 W/kg (mW/g) averaged over 1 gram									

9.3 5 GHz WIFI MIMO Standalone SAR

Table 9-9 MIMO

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	U-NII band	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Measured 10g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported 10g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF7a	XMW1Q	98.71	-0.04	5190	38	U-NII-1	27	13.50	12.31	Top	0	0.674	0.225	1.315	1.013	0.898	0.300	0.561	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	XMW1Q	98.71	-0.06	5190	38	U-NII-1	27	13.50	12.09	Top	0	0.416	0.139	1.384	1.013	0.583	0.195	0.364	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF7a	XMW1Q	98.71	-0.04	5230	46	U-NII-1	27	15.50	14.37	Top	0	0.906	0.300	1.297	1.013	1.190	0.394	0.744	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	XMW1Q	98.71	-0.1	5230	46	U-NII-1	27	16.50	15.36	Top	0	0.888	0.296	1.300	1.013	1.169	0.390	0.731	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF7a	VTXYK	98.85	-0.02	5530	106	U-NII-2C	58.5	9.50	8.32	Top	0	0.300	0.094	1.312	1.012	0.398	0.125	0.249	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF8	VTXYK	98.85	0.08	5530	106	U-NII-2C	58.5	9.50	8.20	Top	0	0.156	0.052	1.349	1.012	0.213	0.071	0.133	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF7a	VTXYK	98.85	0.07	5610	122	U-NII-2C	58.5	13.50	12.79	Top	0	0.732	0.234	1.178	1.012	0.873	0.279	0.546	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF8	VTXYK	98.85	-0.02	5610	122	U-NII-2C	58.5	16.50	15.23	Top	0	0.807	0.263	1.340	1.012	1.094	0.357	0.684	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF7a	VTXYK	98.85	-0.02	5690	138	U-NII-2C	58.5	13.50	12.78	Top	0	0.925	0.293	1.180	1.012	1.105	0.350	0.691	
Body	5 GHz WIFI / IEEE 802.11ac	80	OFDM	WF8	VTXYK	98.85	-0.01	5690	138	U-NII-2C	58.5	17.00	15.76	Top	0	0.692	0.221	1.330	1.012	0.931	0.297	0.582	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF7a	VTXYK	98.71	0.02	5755	151	U-NII-3	27	13.50	12.45	Top	0	0.916	0.282	1.274	1.013	1.182	0.364	0.739	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	VTXYK	98.71	0.03	5755	151	U-NII-3	27	18.00	16.94	Top	0	0.889	0.296	1.276	1.013	1.149	0.383	0.718	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF7a	VTXYK	98.71	0.02	5795	159	U-NII-3	27	13.50	12.39	Top	0	0.911	0.279	1.291	1.013	1.191	0.365	0.744	
Body	5 GHz WIFI / IEEE 802.11n	40	OFDM	WF8	VTXYK	98.71	0.01	5795	159	U-NII-3	27	18.00	16.77	Top	0	0.835	0.286	1.327	1.013	1.122	0.384	0.701	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Body 1.6 W/kg (mW/g) averaged over 1 gram									

Note: Due to the spatial separation of Antenna WF7a and Antenna WF8, two measurement cubes were evaluated during MIMO SAR testing. Cubes 1 and 2 are located over the SAR distributions produced by Antenna WF8 and WF7a, respectively. Due to the spatial separation of the distributions, the conduct power of each antenna was individually considered for each measurement cube to determine the reported SAR.

9.4 2.4 GHz Bluetooth SISO Standalone SAR

Table 9-10 Antenna WF7b

Exposure	Band / Mode	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Measured 10g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported 10g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #
Body	2.4 GHz Bluetooth	FHSS	WF7b	G3GV1	76.76	0.06	2480	78	1.0	14.50	12.70	Back	0	0.024	0.012	1.514	1.010	0.037	0.018	0.023	
Body	2.4 GHz Bluetooth	FHSS	WF7b	G3GV1	76.76	-0.03	2480	78	1.0	14.50	12.70	Top	0	0.137	0.060	1.514	1.010	0.209	0.092	0.131	A3
Body	2.4 GHz Bluetooth	FHSS	WF7b	G3GV1	76.76	0.02	2480	78	1.0	14.50	12.70	Bottom	0	0.000	0.000	1.514	1.010	0.000	0.000	0.000	
Body	2.4 GHz Bluetooth	FHSS	WF7b	G3GV1	76.76	0.01	2480	78	1.0	14.50	12.70	Right	0	0.000	0.000	1.514	1.010	0.000	0.000	0.000	
Body	2.4 GHz Bluetooth	FHSS	WF7b	G3GV1	76.76	-0.03	2480	78	1.0	14.50	12.70	Left	0	0.124	0.053	1.514	1.010	0.190	0.081	0.119	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population												Body 1.6 W/kg (mW/g) averaged over 1 gram									

Note: The reported SAR was scaled to the 77.5% transmission duty factor to determine compliance since the duty factor of the device is permanently limited to 77.5% per manufacturer.

Table 9-11 Antenna WF8

Exposure	Band / Mode	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Measured 10g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported 10g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot #
Body	2.4 GHz Bluetooth	FHSS	WF8	G3GV1	76.76	-0.13	2402	0	1.0	14.50	12.82	Back	0	0.012	0.006	1.472	1.010	0.018	0.009	0.011	
Body	2.4 GHz Bluetooth	FHSS	WF8	G3GV1	76.76	-0.09	2402	0	1.0	14.50	12.82	Top	0	0.102	0.046	1.472	1.010	0.152	0.068	0.095	
Body	2.4 GHz Bluetooth	FHSS	WF8	G3GV1	76.76	0.01	2402	0	1.0	14.50	12.82	Bottom	0	0.000	0.000	1.472	1.010	0.000	0.000	0.000	
Body	2.4 GHz Bluetooth	FHSS	WF8	G3GV1	76.76	0.06	2402	0	1.0	14.50	12.82	Right	0	0.001	0.000	1.472	1.010	0.001	0.000	0.001	
Body	2.4 GHz Bluetooth	FHSS	WF8	G3GV1	76.76	0.08	2402	0	1.0	14.50	12.82	Left	0	0.000	0.000	1.472	1.010	0.000	0.000	0.000	
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population												Body 1.6 W/kg (mW/g) averaged over 1 gram									

Note: The reported SAR was scaled to the 77.5% transmission duty factor to determine compliance since the duty factor of the device is permanently limited to 77.5% per manufacturer.

9.5 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in FCC KDB Publication 616217 D04v01r02, and FCC KDB Publication 447498 D04v01.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical, and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D04v01.
6. Per FCC KDB 865664 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were greater than or equal to 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 10 for variability analysis.
7. FCC KDB Publication 616217 D04v01r02 Section 4.3, SAR tests are required for the back surface and edges of the tablet with the tablet touching the phantom. The SAR Exclusion Threshold in FCC KDB 447498 D04v01 was applied to determine SAR test exclusion for adjacent edge configurations.
8. This device utilizes power reduction for some wireless modes and technologies, as outlined in Section 1.2. The maximum output power allowed for each transmitter and exposure condition was evaluated for SAR compliance based on expected use conditions and simultaneous transmission scenarios.
9. The orange highlights throughout the report represent the highest scaled SAR per Equipment Class.
10.

WLAN Notes:

1. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4 GHz WIFI single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n/ax) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 6.2.4 for more information.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 5 GHz WIFI single transmission chain operations, the initial test configuration was selected according to the

transmission mode with the highest maximum allowed powers. Other transmission modes were not investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than 1.2 W/kg for 1g evaluations. See Section 6.2.5 for more information.

3. Per KDB Publication 248227 D01v02r02, SAR for MIMO was evaluated by following the simultaneous SAR provisions from KDB Publication 447498 D04v01 by either evaluating the sum of the 1g SAR values of each antenna transmitting independently or making a SAR measurement with both antennas transmitting simultaneously. Please refer to Appendix E SAR Multi-Tx and Antenna SAR Considerations.
4. When the maximum reported 1g averaged SAR is ≤0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg for 1g evaluations or all test channels were measured.
5. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance. Procedures used to measure the duty factor are identical to that in the associated EMC test reports.
6. The time-averaged mechanism for WLAN operations was disabled for the above SAR measurements. The SAR was scaled to the maximum time-averaged output power.

Bluetooth Notes

1. Bluetooth SAR was evaluated with a test mode with hopping disabled with DH5 operation. The reported SAR was scaled to the 77.5% transmission duty factor to determine compliance since the duty factor of the device is limited to 77.5% per manufacturer. See Section 7.5 for the time domain plot and calculation for the duty factor of the device.

10 SAR MEASUREMENT VARIABILITY

10.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01r04, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1g SAR limit).
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg.
5) When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

Table 10-1
Body SAR Measurement Variability Results

BODY VARIABILITY RESULTS											
Band	FREQUENCY		Mode	Service	Ant	Data Rate (Mbps)	Side	Spacing	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio
	MHz	Ch.							(W/kg)	(W/kg)	
2450	2462	11	2.4 GHz WIFI/ IEEE 802.11b	DSSS	Ant WF8	1	Top	0 mm	0.947	0.943	1.00
5250	5270	54	5 GHz WIFI/ IEEE 802.11n	OFDM	Ant WF8	13.5	Top	0 mm	0.991	0.938	1.06
5600	5610	122	5 GHz WIFI/ IEEE 802.11ac	OFDM	Ant WF7a	29.3	Top	0mm	0.993	0.949	1.05
5750	5775	155	5 GHz WIFI/ IEEE 802.11ac	OFDM	Ant WF7a	29.3	Top	0 mm	0.973	0.973	1.00
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram			

10.2 Measurement Uncertainty

The measured SAR was <1.5 W/kg for 1g and <3.75 W/kg for 10g for all frequency bands. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEEE 1528-2013 was not required.

11 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E4404B	Spectrum Analyzer	N/A	N/A	N/A	MY45113242
Agilent	E4438C	ESG Vector Signal Generator	10/23/2024	Annual	10/23/2025	MY45093852
Agilent	E4438C	ESG Vector Signal Generator	3/25/2024	Annual	3/25/2025	MY47270002
Agilent	N5182A	MXG Vector Signal Generator	7/9/2024	Annual	7/9/2025	MY48180366
Agilent	N5182A	MXG Vector Signal Generator	3/7/2024	Annual	3/7/2025	MY47420603
Agilent	8753ES	S-Parameter Vector Network Analyzer	1/10/2024	Annual	1/10/2025	MY40001472
Agilent	8753ES	S-Parameter Vector Network Analyzer	9/25/2024	Annual	9/25/2025	MY40003841
Agilent	E5515C	Wireless Communications Test Set	CBT	N/A	CBT	GB46310798
Agilent	E5515C	Wireless Communications Test Set	CBT	N/A	CBT	US41140256
Agilent	N4010A	Wireless Connectivity Test Set	N/A	N/A	N/A	GB46170464
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433973
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433974
Amplifier Research	150A100C	Amplifier	CBT	N/A	CBT	350132
Anritsu	MN8110B	I/O Adaptor	CBT	N/A	CBT	6261747881
Anritsu	ML2496A	Power Meter	7/15/2024	Annual	7/15/2025	1138001
Anritsu	ML2496A	Power Meter	6/24/2024	Annual	6/24/2025	1840005
Anritsu	MA2411B	Pulse Power Sensor	9/5/2024	Annual	9/5/2025	1726262
Anritsu	MA2411B	Pulse Power Sensor	10/21/2024	Annual	10/21/2025	1027293
Anritsu	MA24106A	USB Power Sensor	7/10/2024	Annual	7/10/2025	1827530
Anritsu	MA24106A	USB Power Sensor	4/15/2024	Annual	4/15/2025	1827528
Mini-Circuits	PWR-4GHS	USB Power Sensor	6/12/2024	Annual	6/12/2025	12001070013
Control Company	4052	Long Stem Thermometer	2/27/2024	Biennial	2/27/2026	240174346
Control Company	4052	Long Stem Thermometer	2/27/2024	Biennial	2/27/2026	240171096
Control Company	4052	Long Stem Thermometer	2/27/2024	Biennial	2/27/2026	240171059
Control Company	4040	Therm./ Clock/ Humidity Monitor	4/15/2024	Biennial	4/15/2026	240310280
Control Company	4040	Therm./ Clock/ Humidity Monitor	4/15/2024	Biennial	4/15/2026	240310282
Control Company	S66279	Therm./ Clock/ Humidity Monitor	2/16/2024	Biennial	2/16/2026	240140051
Mitutoyo	500-196-30	CD-6"ASX 6Inch Digital Caliper	2/16/2022	Triennial	2/16/2025	A20238413
Keysight Technologies	N9020A	MXA Signal Analyzer	7/8/2024	Annual	7/8/2025	MY48010233
Agilent	N9020A	MXA Signal Analyzer	6/14/2024	Annual	6/14/2025	MY56470202
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
Mini-Circuits	VLF-6000+	Low Pass Filter DC to 6000 MHz	7/10/2024	Annual	7/10/2025	31634
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	ZUDC10-83-S+	Directional Coupler	CBT	N/A	CBT	2050
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Seekonk	NC-100	Torque Wrench	4/2/2024	Biennial	4/2/2026	1262
SPEAG	DAK-3.5	Dielectric Assessment Kit	11/5/2024	Annual	11/5/2025	1277
SPEAG	DAKS-3.5	Portable Dielectric Assessment Kit	8/7/2024	Annual	8/7/2025	1041
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1237
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1331
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1390
SPEAG	D2450V2	2450 MHz SAR Dipole	5/11/2022	Triennial	5/11/2025	750
SPEAG	D5GHzV2	5 GHz SAR Dipole	3/12/2024	Annual	3/12/2025	1123
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/4/2024	Annual	9/4/2025	1403
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/9/2024	Annual	2/9/2025	467
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/8/2024	Annual	5/8/2025	701
SPEAG	EX3DV4	SAR Probe	2/9/2024	Annual	2/9/2025	7427
SPEAG	EX3DV4	SAR Probe	5/13/2024	Annual	5/13/2025	7416
SPEAG	EX3DV4	SAR Probe	9/9/2024	Annual	9/9/2025	7639

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. This calibration verification procedure applies to the system verification and output power measurements. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurements.

12 MEASUREMENT UNCERTAINTIES

Applicable for SAR measurements < 6 GHz:

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	IEEE 1528 Sec.	Tol. (± %)	Prob. Dist.	Div.	c_i 1gm	c_i 10 gms	1gm u_i (± %)	10gms u_i (± %)	v_i
Measurement System									
Probe Calibration	E.2.1	7	N	1	1	1	7.0	7.0	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	0.7	0.7	0.9	0.9	∞
Boundary Effect	E.2.3	2	R	1.732	1	1	1.2	1.2	∞
Linearity	E.2.4	0.3	N	1	1	1	0.3	0.3	∞
System Detection Limits	E.2.4	0.25	R	1.732	1	1	0.1	0.1	∞
Modulation Response	E.2.5	4.8	R	1.732	1	1	2.8	2.8	∞
Readout Electronics	E.2.6	0.3	N	1	1	1	0.3	0.3	∞
Response Time	E.2.7	0.8	R	1.732	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.732	1	1	1.5	1.5	∞
RF Ambient Conditions - Noise	E.6.1	3	R	1.732	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	3	R	1.732	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.8	R	1.732	1	1	0.5	0.5	∞
Probe Positioning w/ respect to Phantom	E.6.3	6.7	R	1.732	1	1	3.9	3.9	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	4	R	1.732	1	1	2.3	2.3	∞
Test Sample Related									
Test Sample Positioning	E.4.2	3.12	N	1	1	1	3.1	3.1	35
Device Holder Uncertainty	E.4.1	1.67	N	1	1	1	1.7	1.7	5
Output Power Variation - SAR drift measurement	E.2.9	5	R	1.732	1	1	2.9	2.9	∞
SAR Scaling	E.6.5	0	R	1.732	1	1	0.0	0.0	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	7.6	R	1.73	1.0	1.0	4.4	4.4	∞
Liquid Conductivity - measurement uncertainty	E.3.3	4.3	N	1	0.78	0.71	3.3	3.0	76
Liquid Permittivity - measurement uncertainty	E.3.3	4.2	N	1	0.23	0.26	1.0	1.1	75
Liquid Conductivity - Temperature Uncertainty	E.3.4	3.4	R	1.732	0.78	0.71	1.5	1.4	∞
Liquid Permittivity - Temperature Unceritainty	E.3.4	0.6	R	1.732	0.23	0.26	0.1	0.1	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Combined Standard Uncertainty (k=1)			RSS				12.2	12.0	191
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				24.4	24.0	

The above measurement uncertainties are according to IEEE Std. 1528-2013

13 CONCLUSION

13.1 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Innovation, Science, and Economic Development Canada, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g., ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g., age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [3]

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