PCTEST
18855 Adams Ct, Morgan Hill, CA 95037 USA
Tel. +1.410.290.6652 / Fax +1.410.290.6654
http://www.pctest.com

SAR EVALUATION REPORT

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

Date of Testing:
06/13/2021 - 08/02/2021
Test Site/Location:
PCTEST Lab, Morgan Hill, CA, USA
Document Serial No.:
1C2106080048-11.BCG (Rev 1)

FCC ID:	**BCGA2567**
APPLICANT:	**APPLE, INC.**

DUT Type:	Tablet Device
Application Type:	Certification
FCC Rule Part(s):	CFR §2.1093
Model:	A2567

Equipment Class	Band & Mode	Tx Frequency	SAR
			1g Body (W/kg)
DTS	2.4 GHz WLAN	2412 - 2472 MHz	0.84
NII	U-NII-1	5180 - 5240 MHz	1.18
NII	U-NII-2A	5260 - 5320 MHz	1.04
NII	U-NII-2C	5500 - 5720 MHz	1.17
NII	U-NII-3	5745 - 5825 MHz	1.18
DSS/DTS	Bluetooth	2402 - 2480 MHz	0.84
Simultaneous SAR per KDB 690783 D01v01r03:			1.59

Note: This revised Test Report supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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 1.7 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.

Randy Ortanez
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.

TABLE OF CONTENTS

1 DEVICE UNDER TEST

1.1 Device Overview

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

1.2 Power Reduction for SAR

There is no power reduction used for any band/mode implemented in this device for SAR purposes.

This device used an independent mechanism that limits WIFI powers to a time-averaged output power. For the purposes of this test report, all SAR measurements were performed with the algorithm disabled at the maximum time-averaged output power level. Appendix G includes verification data for this time-averaged SAR mechanism.

1.3 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 D01v06.

1.3.1 Maximum Time-Averaged Output Power

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

Mode/ Band			IEEE 802.11b (2.4 GHz)		IEEE 802.11g (2.4 GHz)		IEEE 802.11n (2.4 GHz)		IEEE 802.11ax SU (2.4 GHz)	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - Single Tx Chain (dBm) - Antenna WF7	20 MHz Bandwidth	1	18.50	17.00	15.00	13.50	15.00	13.50	14.50	13.00
		2	20.00	18.50	19.50	18.00	19.50	18.00	18.50	17.00
		3	20.25	18.75	20.00	18.50	20.00	18.50	19.50	18.00
		4	20.25	18.75	20.25	18.75	20.25	18.75	20.00	18.50
		5	20.25	18.75	20.25	18.75	20.25	18.75	20.25	18.75
		6	20.25	18.75	20.25	18.75	20.25	18.75	20.25	18.75
		7	20.25	18.75	20.25	18.75	20.25	18.75	20.25	18.75
		8	20.25	18.75	20.25	18.75	20.25	18.75	20.00	18.50
		9	20.25	18.75	20.00	18.50	20.00	18.50	19.00	17.50
		10	20.25	18.75	19.50	18.00	19.50	18.00	18.00	16.50
		11	20.25	18.75	15.50	14.00	15.50	14.00	14.50	13.00
		12	19.50	18.00	14.00	12.50	14.00	12.50	12.50	11.00
		13	17.50	16.00	10.00	8.50	10.00	8.50	N/A	N/A

Mode/ Band			IEEE 802.11g (2.4 GHz)		IEEE 802.11n (2.4 GHz)		IEEE 802.11ax SU (2.4 GHz)	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) - Antenna WF7	20 MHz Bandwidth	1	14.00	12.50	14.00	12.50	13.50	12.00
		2	17.50	16.00	17.50	16.00	17.50	16.00
		3	19.00	17.50	19.00	17.50	18.50	17.00
		4	20.00	18.50	20.00	18.50	19.50	18.00
		5	20.25	18.75	20.25	18.75	20.00	18.50
		6	20.25	18.75	20.25	18.75	20.25	18.75
		7	20.25	18.75	20.25	18.75	20.00	18.50
		8	20.00	18.50	20.00	18.50	19.00	17.50
		9	19.50	18.00	19.50	18.00	18.25	16.75
		10	18.00	16.50	18.00	16.50	17.00	15.50
		11	14.50	13.00	14.50	13.00	13.25	11.75
		12	12.00	10.50	12.00	10.50	12.00	10.50
		13	8.25	6.75	8.25	6.75	N/A	N/A

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

Mode/ Band			IEEE 802.11b (2.4 GHz)		IEEE 802.11g (2.4 GHz)		IEEE 802.11n (2.4 GHz)		IEEE 802.11ax SU (2.4 GHz)	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - Single Tx Chain (dBm) - Antenna WF8	20 MHz Bandwidth	1	18.50	17.00	15.00	13.50	15.00	13.50	14.50	13.00
		2	20.00	18.50	19.50	18.00	19.50	18.00	18.50	17.00
		3	20.25	18.75	20.00	18.50	20.00	18.50	19.50	18.00
		4	20.25	18.75	20.25	18.75	20.25	18.75	20.00	18.50
		5	20.25	18.75	20.25	18.75	20.25	18.75	20.25	18.75
		6	20.25	18.75	20.25	18.75	20.25	18.75	20.25	18.75
		7	20.25	18.75	20.25	18.75	20.25	18.75	20.25	18.75
		8	20.25	18.75	20.25	18.75	20.25	18.75	20.00	18.50
		9	20.25	18.75	20.00	18.50	20.00	18.50	19.00	17.50
		10	20.25	18.75	19.50	18.00	19.50	18.00	18.00	16.50
		11	20.25	18.75	15.50	14.00	15.50	14.00	14.50	13.00
		12	19.50	18.00	14.00	12.50	14.00	12.50	12.50	11.00
		13	17.50	16.00	10.00	8.50	10.00	8.50	N/A	N/A

Mode/ Band			IEEE 802.11g (2.4 GHz)		IEEE 802.11n (2.4 GHz)		IEEE 802.11ax SU (2.4 GHz)	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) - Antenna WF8	20 MHz Bandwidth	1	14.00	12.50	14.00	12.50	13.50	12.00
		2	17.50	16.00	17.50	16.00	17.50	16.00
		3	19.00	17.50	19.00	17.50	18.50	17.00
		4	20.00	18.50	20.00	18.50	19.50	18.00
		5	20.25	18.75	20.25	18.75	20.00	18.50
		6	20.25	18.75	20.25	18.75	20.25	18.75
		7	20.25	18.75	20.25	18.75	20.00	18.50
		8	20.00	18.50	20.00	18.50	19.00	17.50
		9	19.50	18.00	19.50	18.00	18.25	16.75
		10	18.00	16.50	18.00	16.50	17.00	15.50
		11	14.50	13.00	14.50	13.00	13.25	11.75
		12	12.00	10.50	12.00	10.50	12.00	10.50
		13	8.25	6.75	8.25	6.75	N/A	N/A

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

Mode/ Band			IEEE 802.11a (5 GHz)		IEEE 802.11n (5 GHz)		IEEE 802.11ac (5 GHz)		IEEE 802.11ax SU (5 GHz)	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - Single Tx Chain (dBm) - 5GHz Antenna WF5T	20 MHz Bandwidth	36	15.25	13.75	15.25	13.75	15.25	13.75	15.25	13.75
		40	15.25	13.75	15.25	13.75	15.25	13.75	15.25	13.75
		44	15.25	13.75	15.25	13.75	15.25	13.75	15.25	13.75
		48	15.25	13.75	15.25	13.75	15.25	13.75	15.25	13.75
		52	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00
		56	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00
		60	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00
		64	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00
		100	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		104	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		108	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		112	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		116	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		120	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		124	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		128	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		132	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		136	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		140	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		144	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		149	14.50	13.00	14.50	13.00	14.50	13.00	14.50	13.00
		153	14.50	13.00	14.50	13.00	14.50	13.00	14.50	13.00
		157	14.50	13.00	14.50	13.00	14.50	13.00	14.50	13.00
		161	14.50	13.00	14.50	13.00	14.50	13.00	14.50	13.00
		165	14.50	13.00	14.50	13.00	14.50	13.00	14.50	13.00
	40 MHz Bandwidth	38			15.25	13.75	15.25	13.75	15.25	13.75
		46			15.25	13.75	15.25	13.75	15.25	13.75
		54			15.50	14.00	15.50	14.00	15.50	14.00
		62			15.00	13.50	15.00	13.50	14.00	12.50
		102			14.00	12.50	14.00	12.50	13.75	12.25
		110			14.75	13.25	14.75	13.25	14.75	13.25
		118			14.75	13.25	14.75	13.25	14.75	13.25
		126			14.75	13.25	14.75	13.25	14.75	13.25
		134			14.75	13.25	14.75	13.25	14.75	13.25
		142			14.75	13.25	14.75	13.25	14.75	13.25
		151			14.50	13.00	14.50	13.00	14.50	13.00
		159			14.50	13.00	14.50	13.00	14.50	13.00
	80 MHz Bandwidth	42					15.00	13.50	14.00	12.50
		58					13.50	12.00	13.25	11.75
		106					13.75	12.25	13.50	12.00
		122					14.75	13.25	14.75	13.25
		138					14.75	13.25	14.75	13.25
		155					14.50	13.00	14.50	13.00

Mode/ Band			IEEE 802.11a (5 GHz)		IEEE 802.11n (5 GHz)		IEEE 802.11ac (5 GHz)		IEEE 802.11ax SU (5 GHz)	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) CDD - 5GHz Antenna WF5T	20 MHz Bandwidth	36	15.25	13.75	15.25	13.75	15.25	13.75	15.25	13.75
		40	15.25	13.75	15.25	13.75	15.25	13.75	15.25	13.75
		44	15.25	13.75	15.25	13.75	15.25	13.75	15.25	13.75
		48	15.25	13.75	15.25	13.75	15.25	13.75	15.25	13.75
		52	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00
		56	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00
		60	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00
		64	15.50	14.00	15.50	14.00	15.50	14.00	15.50	14.00
		100	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		104	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		108	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		112	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		116	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		120	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		124	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		128	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		132	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		136	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		140	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		144	14.75	13.25	14.75	13.25	14.75	13.25	14.75	13.25
		149	14.50	13.00	14.50	13.00	14.50	13.00	14.50	13.00
		153	14.50	13.00	14.50	13.00	14.50	13.00	14.50	13.00
		157	14.50	13.00	14.50	13.00	14.50	13.00	14.50	13.00
		161	14.50	13.00	14.50	13.00	14.50	13.00	14.50	13.00
		165	14.50	13.00	14.50	13.00	14.50	13.00	14.50	13.00
	40 MHz Bandwidth	38			15.00	13.50	15.00	13.50	14.50	13.00
		46			15.25	13.75	15.25	13.75	15.25	13.75
		54			15.50	14.00	15.50	14.00	15.50	14.00
		62			14.00	12.50	14.00	12.50	13.75	12.25
		102			13.50	12.00	13.50	12.00	13.50	12.00
		110			14.75	13.25	14.75	13.25	14.75	13.25
		118			14.75	13.25	14.75	13.25	14.75	13.25
		126			14.75	13.25	14.75	13.25	14.75	13.25
		134			14.75	13.25	14.75	13.25	14.75	13.25
		142			14.75	13.25	14.75	13.25	14.75	13.25
		151			14.50	13.00	14.50	13.00	14.50	13.00
		159			14.50	13.00	14.50	13.00	14.50	13.00
	80 MHz Bandwidth	42					13.50	12.00	13.00	11.50
		58					13.25	11.75	12.75	11.25
		106					13.50	12.00	13.00	11.50
		122					14.75	13.25	14.75	13.25
		138					14.75	13.25	14.75	13.25
		155					14.50	13.00	14.50	13.00

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

Mode/ Band			IEEE 802.11n (5 GHz)		IEEE 802.11ac (5 GHz)		IEEE 802.11ax SU (5 GHz)	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) SDM - 5GHz Antenna WF5T	20 MHz Bandwidth	36	15.25	13.75	15.25	13.75	15.25	13.75
		40	15.25	13.75	15.25	13.75	15.25	13.75
		44	15.25	13.75	15.25	13.75	15.25	13.75
		48	15.25	13.75	15.25	13.75	15.25	13.75
		52	15.50	14.00	15.50	14.00	15.50	14.00
		56	15.50	14.00	15.50	14.00	15.50	14.00
		60	15.50	14.00	15.50	14.00	15.50	14.00
		64	15.50	14.00	15.50	14.00	15.50	14.00
		100	14.75	13.25	14.75	13.25	14.75	13.25
		104	14.75	13.25	14.75	13.25	14.75	13.25
		108	14.75	13.25	14.75	13.25	14.75	13.25
		112	14.75	13.25	14.75	13.25	14.75	13.25
		116	14.75	13.25	14.75	13.25	14.75	13.25
		120	14.75	13.25	14.75	13.25	14.75	13.25
		124	14.75	13.25	14.75	13.25	14.75	13.25
		128	14.75	13.25	14.75	13.25	14.75	13.25
		132	14.75	13.25	14.75	13.25	14.75	13.25
		136	14.75	13.25	14.75	13.25	14.75	13.25
		140	14.75	13.25	14.75	13.25	14.75	13.25
		144	14.75	13.25	14.75	13.25	14.75	13.25
		149	14.50	13.00	14.50	13.00	14.50	13.00
		153	14.50	13.00	14.50	13.00	14.50	13.00
		157	14.50	13.00	14.50	13.00	14.50	13.00
		161	14.50	13.00	14.50	13.00	14.50	13.00
		165	14.50	13.00	14.50	13.00	14.50	13.00
	40 MHz Bandwidth	38	15.00	13.50	15.00	13.50	14.50	13.00
		46	15.25	13.75	15.25	13.75	15.25	13.75
		54	15.50	14.00	15.50	14.00	15.50	14.00
		62	14.00	12.50	14.00	12.50	13.75	12.25
		102	13.50	12.00	13.50	12.00	13.50	12.00
		110	14.75	13.25	14.75	13.25	14.75	13.25
		118	14.75	13.25	14.75	13.25	14.75	13.25
		126	14.75	13.25	14.75	13.25	14.75	13.25
		134	14.75	13.25	14.75	13.25	14.75	13.25
		142	14.75	13.25	14.75	13.25	14.75	13.25
		151	14.50	13.00	14.50	13.00	14.50	13.00
		159	14.50	13.00	14.50	13.00	14.50	13.00
	80 MHz Bandwidth	42	[redacted]		13.50	12.00	13.00	11.50
		58			13.25	11.75	12.75	11.25
		106			13.50	12.00	13.00	11.50
		122			14.75	13.25	14.75	13.25
		138			14.75	13.25	14.75	13.25
		155			14.50	13.00	14.50	13.00

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

Mode/ Band			IEEE 802.11a (5 GHz)		IEEE 802.11n (5 GHz)		IEEE 802.11ac (5 GHz)		IEEE 802.11ax SU (5 GHz)	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - Single Tx Chain (dBm) - 5GHz Antenna WF2	20 MHz Bandwidth	36	17.25	15.75	17.25	15.75	17.25	15.75	17.25	15.75
		40	17.25	15.75	17.25	15.75	17.25	15.75	17.25	15.75
		44	17.25	15.75	17.25	15.75	17.25	15.75	17.25	15.75
		48	17.25	15.75	17.25	15.75	17.25	15.75	17.25	15.75
		52	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
		56	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
		60	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
		64	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
		100	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
		104	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
		108	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
		112	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
		116	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
		120	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
		124	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
		128	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
		132	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
		136	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
		140	16.50	15.00	16.50	15.00	16.50	15.00	15.00	13.50
		144	17.00	15.50	17.00	15.50	17.00	15.50	17.00	15.50
		149	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00
		153	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00
		157	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00
		161	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00
		165	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00
	40 MHz Bandwidth	38			16.00	14.50	16.00	14.50	15.50	14.00
		46			17.25	15.75	17.25	15.75	17.25	15.75
		54			17.00	15.50	17.00	15.50	17.00	15.50
		62			15.00	13.50	15.00	13.50	14.00	12.50
		102			14.00	12.50	14.00	12.50	13.75	12.25
		110			17.00	15.50	17.00	15.50	17.00	15.50
		118			17.00	15.50	17.00	15.50	17.00	15.50
		126			17.00	15.50	17.00	15.50	17.00	15.50
		134			17.00	15.50	17.00	15.50	17.00	15.50
		142			17.00	15.50	17.00	15.50	17.00	15.50
		151			16.50	15.00	16.50	15.00	16.50	15.00
		159			16.50	15.00	16.50	15.00	16.50	15.00
	80 MHz Bandwidth	42					15.00	13.50	14.00	12.50
		58					13.50	12.00	13.25	11.75
		106					13.75	12.25	13.50	12.00
		122					17.00	15.50	17.00	15.50
		138					17.00	15.50	17.00	15.50
		155					16.50	15.00	16.50	15.00

Mode/ Band			IEEE 802.11a (5 GHz)		IEEE 802.11n (5 GHz)		IEEE 802.11ac (5 GHz)		IEEE 802.11ax SU (5 GHz)	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) CDD - 5GHz Antenna WF2	20 MHz Bandwidth	36	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
		44	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
		52	16.25	14.75	16.25	14.75	16.25	14.75	16.25	14.75
		56	16.25	14.75	16.25	14.75	16.25	14.75	16.25	14.75
		60	16.25	14.75	16.25	14.75	16.25	14.75	16.25	14.75
		64	16.25	14.75	16.25	14.75	16.25	14.75	16.25	14.75
		100	16.00	14.50	16.00	14.50	16.00	14.50	16.00	14.50
		104	16.00	14.50	16.00	14.50	16.00	14.50	16.00	14.50
		108	16.00	14.50	16.00	14.50	16.00	14.50	16.00	14.50
		112	16.00	14.50	16.00	14.50	16.00	14.50	16.00	14.50
		116	16.00	14.50	16.00	14.50	16.00	14.50	16.00	14.50
		120	16.00	14.50	16.00	14.50	16.00	14.50	16.00	14.50
		124	16.00	14.50	16.00	14.50	16.00	14.50	16.00	14.50
		128	16.00	14.50	16.00	14.50	16.00	14.50	16.00	14.50
		132	16.00	14.50	16.00	14.50	16.00	14.50	16.00	14.50
		136	16.00	14.50	16.00	14.50	16.00	14.50	16.00	14.50
		140	15.50	14.00	15.50	14.00	15.50	14.00	14.75	13.25
		144	16.00	14.50	16.00	14.50	16.00	14.50	16.00	14.50
		149	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00
		153	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00
		157	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00
		161	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00
		165	16.50	15.00	16.50	15.00	16.50	15.00	16.50	15.00
	40 MHz Bandwidth	38			15.00	13.50	15.00	13.50	14.50	13.00
		46			17.25	15.75	17.25	15.75	17.25	15.75
		54			17.00	15.50	17.00	15.50	17.00	15.50
		62			14.00	12.50	14.00	12.50	13.75	12.25
		102			13.50	12.00	13.50	12.00	13.50	12.00
		110			17.00	15.50	17.00	15.50	17.00	15.50
		118			17.00	15.50	17.00	15.50	17.00	15.50
		126			17.00	15.50	17.00	15.50	17.00	15.50
		134			17.00	15.50	17.00	15.50	16.50	15.00
		142			17.00	15.50	17.00	15.50	17.00	15.50
		151			16.50	15.00	16.50	15.00	16.50	15.00
		159			16.50	15.00	16.50	15.00	16.50	15.00
	80 MHz Bandwidth	42					13.50	12.00	13.00	11.50
		58					13.25	11.75	12.75	11.25
		106					13.50	12.00	13.00	11.50
		122					17.00	15.50	17.00	15.50
		138					17.00	15.50	17.00	15.50
		155					16.50	15.00	16.50	15.00

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

Mode/ Band			IEEE 802.11n (5 GHz)		IEEE 802.11ac (5 GHz)		IEEE 802.11ax SU (5 GHz)	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) SDM - 5GHz Antenna WF2	20 MHz Bandwidth	36	16.75	15.25	16.75	15.25	16.75	15.25
		40	16.75	15.25	16.75	15.25	16.75	15.25
		44	16.75	15.25	16.75	15.25	16.75	15.25
		48	16.75	15.25	16.75	15.25	16.75	15.25
		52	16.75	15.25	16.75	15.25	16.75	15.25
		56	16.75	15.25	16.75	15.25	16.75	15.25
		60	16.75	15.25	16.75	15.25	16.75	15.25
		64	16.75	15.25	16.75	15.25	16.75	15.25
		100	16.75	15.25	16.75	15.25	16.50	15.00
		104	16.75	15.25	16.75	15.25	16.75	15.25
		108	16.75	15.25	16.75	15.25	16.75	15.25
		112	16.75	15.25	16.75	15.25	16.75	15.25
		116	16.75	15.25	16.75	15.25	16.75	15.25
		120	16.75	15.25	16.75	15.25	16.75	15.25
		124	16.75	15.25	16.75	15.25	16.75	15.25
		128	16.75	15.25	16.75	15.25	16.75	15.25
		132	16.75	15.25	16.75	15.25	16.75	15.25
		136	16.75	15.25	16.75	15.25	16.75	15.25
		140	15.50	14.00	15.50	14.00	14.75	13.25
		144	16.75	15.25	16.75	15.25	16.75	15.25
		149	16.50	15.00	16.50	15.00	16.50	15.00
		153	16.50	15.00	16.50	15.00	16.50	15.00
		157	16.50	15.00	16.50	15.00	16.50	15.00
		161	16.50	15.00	16.50	15.00	16.50	15.00
		165	16.50	15.00	16.50	15.00	16.50	15.00
	40 MHz Bandwidth	38	15.00	13.50	15.00	13.50	14.50	13.00
		46	17.25	15.75	17.25	15.75	17.25	15.75
		54	17.00	15.50	17.00	15.50	17.00	15.50
		62	14.00	12.50	14.00	12.50	13.75	12.25
		102	13.50	12.00	13.50	12.00	13.50	12.00
		110	17.00	15.50	17.00	15.50	17.00	15.50
		118	17.00	15.50	17.00	15.50	17.00	15.50
		126	17.00	15.50	17.00	15.50	17.00	15.50
		134	17.00	15.50	17.00	15.50	16.50	15.00
		142	17.00	15.50	17.00	15.50	17.00	15.50
		151	16.50	15.00	16.50	15.00	16.50	15.00
		159	16.50	15.00	16.50	15.00	16.50	15.00
	80 MHz Bandwidth	42	[redacted]		13.50	12.00	13.00	11.50
		58			13.25	11.75	12.75	11.25
		106			13.50	12.00	13.00	11.50
		122			17.00	15.50	17.00	15.50
		138			17.00	15.50	17.00	15.50
		155			16.50	15.00	16.50	15.00

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

1.3.1 Bluetooth Maximum Output Power

Mode / Band		Modulated Average - Single Tx Chain (dBm) - Antenna WF7
Bluetooth BDR/LE	Maximum	**19.50**
	Nominal	**18.00**
Bluetooth EDR	Maximum	**15.00**
	Nominal	**13.50**
Bluetooth HDR	Maximum	**12.00**
	Nominal	**10.50**

Mode / Band		Modulated Average - TXBF (dBm) - Antenna WF7
Bluetooth BDR/LE	Maximum	**17.00**
	Nominal	**15.50**
Bluetooth EDR	Maximum	**13.50**
	Nominal	**12.00**
Bluetooth HDR	Maximum	**12.00**
	Nominal	**10.50**

Note: In TxBF operations, each antenna transmits at maximum allowed powers as indicated above.

Mode / Band		Modulated Average - Single Tx Chain (dBm) - Antenna WF8
Bluetooth BDR/LE	Maximum	**17.50**
	Nominal	**16.00**
Bluetooth EDR	Maximum	**15.00**
	Nominal	**13.50**
Bluetooth HDR	Maximum	**12.00**
	Nominal	**10.50**

Mode / Band		Modulated Average - TXBF (dBm) - Antenna WF8
Bluetooth BDR/LE	Maximum	**17.00**
	Nominal	**15.50**
Bluetooth EDR	Maximum	**13.50**
	Nominal	**12.00**
Bluetooth HDR	Maximum	**12.00**
	Nominal	**10.50**

Note: In TxBF operations, each antenna transmits at maximum allowed powers as indicated above.

1.4 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 Appendix E. Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC filings.

Table 1-1
Device Edges/Sides for SAR Testing

Mode	Back	Front	Top	Bottom	Right	Left
2.4 GHz WLAN Antenna WF7	Yes	No	Yes	No	No	Yes
2.4 GHz WLAN Antenna WF8	Yes	No	Yes	No	Yes	No
5 GHz WLAN Antenna WF5T	Yes	No	Yes	No	Yes	No
5 GHz WLAN Antenna WF2	Yes	No	No	Yes	Yes	No
Bluetooth Antenna WF7	Yes	No	Yes	No	No	Yes
Bluetooth Antenna WF8	Yes	No	Yes	No	Yes	No

Note: Per FCC KDB Publication 616217 D04v01r01, particular edges were not required to be evaluated for SAR based on the SAR exclusion threshold in KDB 447498 D01V06. Additional edges may have been evaluated for simultaneous transmission analysis.

1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v06, 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 D01v06 4.3.2 procedures.

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Body
1	2.4 GHz Wi-Fi MIMO	Yes
2	2.4 GHz Bluetooth TxBF	Yes
3	5GHz Wi-Fi MIMO	Yes
4	2.4 GHz Bluetooth + 5 GHz Wi-Fi	Yes
5	2.4 GHz Bluetooth + 5 GHz Wi-Fi MIMO	Yes
6	2.4 GHz Bluetooth TxBF + 5 GHz Wi-Fi	Yes
7	2.4 GHz Bluetooth TxBF + 5 GHz Wi-Fi MIMO	Yes

1. 2.4 GHz WLAN, 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously on any antenna (Antenna WF8, WF7).
2. 2.4GHz WLAN and 5 GHz WLAN cannot transmit simultaneously.
3. This device supports 2x2 MIMO Tx for WLAN 802.11 a/g/n/ac/ax. 802.11 a/g/n/ac/ax supports CDD and 802.11 n/ac/ax additionally supports SDM. Each WLAN antenna can transmit independently or together when operation with MIMO.
4. This device supports VOWIFI.

1.6 Miscellaneous SAR Test Considerations

(A) WIFI/BT

Based on the maximum allowed power for the respective antennas, U-NII-1 was evaluated for Antenna WF2 and U-NII-2A was evaluated for Antenna WF5T. Additional testing for U-NII-2A Antenna WF2 and U-NII-1 Antenna WF5T SAR was not required since all reported SAR was less than 1.2 W/kg per FCC KDB Publication 248227 D01v02r02

The WLAN/Bluetooth chipset in this device is produced by two different suppliers. The electrically identical modules are manufactured with the identical mechanical structure to meet the same specifications and functions. Two device variants are referenced as Variant 1 and Variant 2 in this report. WLAN/Bluetooth SAR worst case configuration was spot-checked on Variant 1 and Variant 2.

This device supports channel 1-13 for 2.4 GHz WLAN. However, because channel 12/13 targets are not higher than that of channels 2-11, default channels for SAR testing are determined per FCC KDB 248227 D01V02r02.

This device supports IEEE 802.11ac with the following features:

a) Up to 80 MHz Bandwidth only
b) No aggregate channel configurations
c) 2 Tx antenna output
d) 256 QAM is supported
e) 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) 2 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.

1.7 Guidance Applied

- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v06 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 616217 D04v01r02 (Tablet)
- April 2019 TCB Workshop Notes (IEEE 802.11ax)

1.8 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:

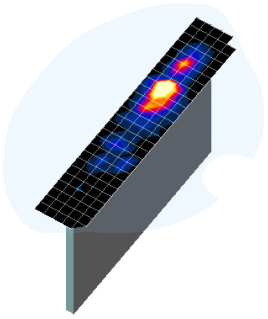


Figure 3-1
Sample SAR Area Scan

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 D01v06 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.

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.

6 FCC MEASUREMENT PROCEDURES

6.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v06, 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.

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.

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 is 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).

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.

6.2.8 MIMO SAR considerations

Per KDB Publication 248227 D01v02r02, the simultaneous SAR provisions in KDB Publication 447498 D01v06 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.

7 RF CONDUCTED POWERS

7.1 WLAN Conducted Powers

Table 7-1
2.4 GHz WLAN Maximum Time-Averaged RF Power – Antenna WF7, Variant 1

2.4GHz Conducted Power [dBm]					
Freq [MHz]	Channel	IEEE Transmission Mode			
		802.11b	802.11g	802.11n	802.11ax (SU)
		Average	Average	Average	Average
2412	1	17.42	13.60	13.45	13.43
2422	3	19.55	N/A	N/A	N/A
2437	6	19.60	19.48	19.30	19.29
2462	11	19.53	14.33	14.40	14.27

Table 7-2
2.4 GHz WLAN Maximum Time-Averaged RF Power – Antenna WF7, Variant 2

2.4GHz Conducted Power [dBm]					
Freq [MHz]	Channel	IEEE Transmission Mode			
		802.11b	802.11g	802.11n	802.11ax (SU)
		Average	Average	Average	Average
2412	1	17.47	14.35	14.38	13.64
2422	3	19.45	N/A	N/A	N/A
2437	6	19.41	19.12	19.29	19.20
2462	11	19.47	14.50	14.21	14.23

Table 7-3
2.4 GHz WLAN Maximum Time-Averaged RF Power – Antenna WF8, Variant 1

2.4GHz Conducted Power [dBm]					
Freq [MHz]	Channel	IEEE Transmission Mode			
		802.11b	802.11g	802.11n	802.11ax (SU)
		Average	Average	Average	Average
2412	1	17.55	13.38	13.35	13.52
2422	3	19.29	N/A	N/A	N/A
2437	6	19.25	19.19	19.60	19.13
2462	11	19.26	14.56	14.31	14.25

Table 7-4
2.4 GHz WLAN Maximum Time-Averaged RF Power – Antenna WF8, Variant 2

2.4GHz Conducted Power [dBm]					
Freq [MHz]	Channel	IEEE Transmission Mode			
		802.11b	802.11g	802.11n	802.11ax (SU)
		Average	Average	Average	Average
2412	1	17.57	14.33	14.25	13.32
2422	3	19.28	N/A	N/A	N/A
2437	6	19.23	19.34	19.46	19.47
2462	11	19.26	14.38	14.45	14.20

Table 7-5
5 GHz WLAN Maximum Time-Averaged RF Power – Antenna WF5T, Variant 1

5GHz (40MHz) Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11n	802.11ac	802.11ax (SU)
		Average	Average	Average
5190	38	14.31	14.26	14.15
5230	46	14.30	14.21	14.12
5270	54	14.50	14.61	14.60
5310	62	13.55	13.55	13.33

5GHz (80MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11ac	802.11ax (SU)
		Average	Average
5530	106	11.81	11.42
5610	122	13.74	13.60
5690	138	13.50	13.51
5775	155	13.72	13.57

Table 7-6
5 GHz WLAN Maximum Time-Averaged RF Power – Antenna WF5T, Variant 2

5GHz (40MHz) Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11n	802.11ac	802.11ax (SU)
		Average	Average	Average
5190	38	14.23	14.33	14.30
5230	46	14.32	14.21	14.42
5270	54	14.47	14.37	14.46
5310	62	13.48	13.51	13.41

5GHz (80MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11ac	802.11ax (SU)
		Average	Average
5530	106	11.83	11.53
5610	122	13.76	13.67
5690	138	13.75	13.37
5775	155	13.66	13.64

Table 7-7
5 GHz WLAN Maximum Time-Averaged RF Power – Antenna WF2, Variant 1

5GHz (40MHz) Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11n	802.11ac	802.11ax (SU)
		Average	Average	Average
5190	38	14.55	14.32	14.47
5230	46	16.10	16.22	16.38
5270	54	16.03	16.01	16.02
5310	62	13.57	13.51	13.66

5GHz (80MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11ac	802.11ax (SU)
		Average	Average
5530	106	11.79	11.54
5610	122	16.05	16.05
5690	138	16.17	16.03
5775	155	15.64	15.64

Table 7-8
5 GHz WLAN Maximum Time-Averaged RF Power – Antenna WF2, Variant 2

5GHz (40MHz) Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11n	802.11ac	802.11ax (SU)
		Average	Average	Average
5190	38	14.44	14.45	14.30
5230	46	16.65	16.28	16.18
5270	54	16.05	16.03	16.10
5310	62	13.50	14.61	13.67

5GHz (80MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11ac	802.11ax (SU)
		Average	Average
5530	106	11.86	11.52
5610	122	16.16	16.01
5690	138	16.00	16.10
5775	155	15.40	15.55

7.1.1 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.
- The WLAN chipset in this device is produced by two different suppliers. The electrically identical modules are manufactured with the identical mechanical structure to meet the same specifications and functions. Two device variants are referenced as Variant 1 and Variant 2 in this report.
- The worst case configurations were evaluated for both variant 1 and variant 2.

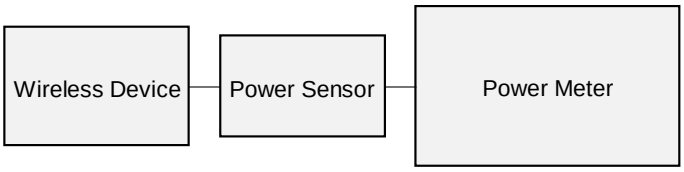


Figure 7-1
Power Measurement Setup

7.2 Bluetooth Conducted Powers

Table 7-9
Maximum Bluetooth Average RF Power – Ant WF7 – Variant 1

Frequency [MHz]	Modulation	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2402	GFSK	1.0	0	18.40	69.183
2441	GFSK	1.0	39	18.45	69.984
2480	GFSK	1.0	78	18.55	71.614

Table 7-10
Maximum Bluetooth Average RF Power – Ant WF7 – Variant 2

Frequency [MHz]	Modulation	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2402	GFSK	1.0	0	18.38	68.865
2441	GFSK	1.0	39	18.33	68.077
2480	GFSK	1.0	78	18.58	72.111

Table 7-11
Maximum Bluetooth Average RF Power – Ant WF8 – Variant 1

Frequency [MHz]	Modulation	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2402	GFSK	1.0	0	16.65	46.238
2441	GFSK	1.0	39	16.70	46.774
2480	GFSK	1.0	78	16.82	48.084

Table 7-12
Maximum Bluetooth Average RF Power – Ant WF8 – Variant 2

Frequency [MHz]	Modulation	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2402	GFSK	1.0	0	16.53	44.978
2441	GFSK	1.0	39	16.61	45.814
2480	GFSK	1.0	78	16.19	41.591

7.3 Bluetooth Duty Cycle

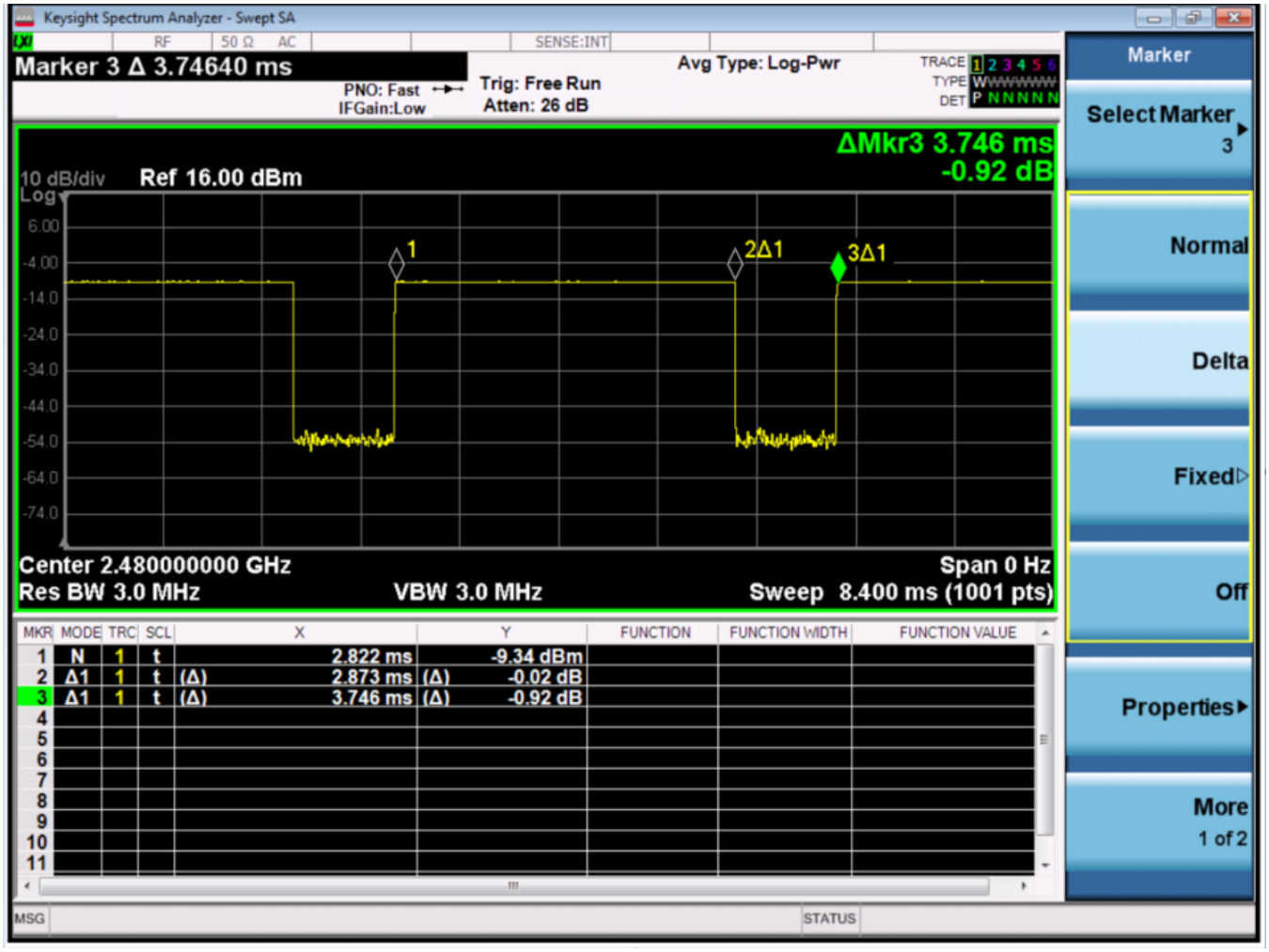


Figure 7-2
Bluetooth Transmission Plot – Antenna WF7 – Variant 1

Equation 7-1
Bluetooth Duty Cycle Calculation

$$Duty\ Cycle = \frac{Pulse\ Width}{Period} * 100\% = \frac{2.873ms}{3.746ms} * 100\% = 76.7\%$$

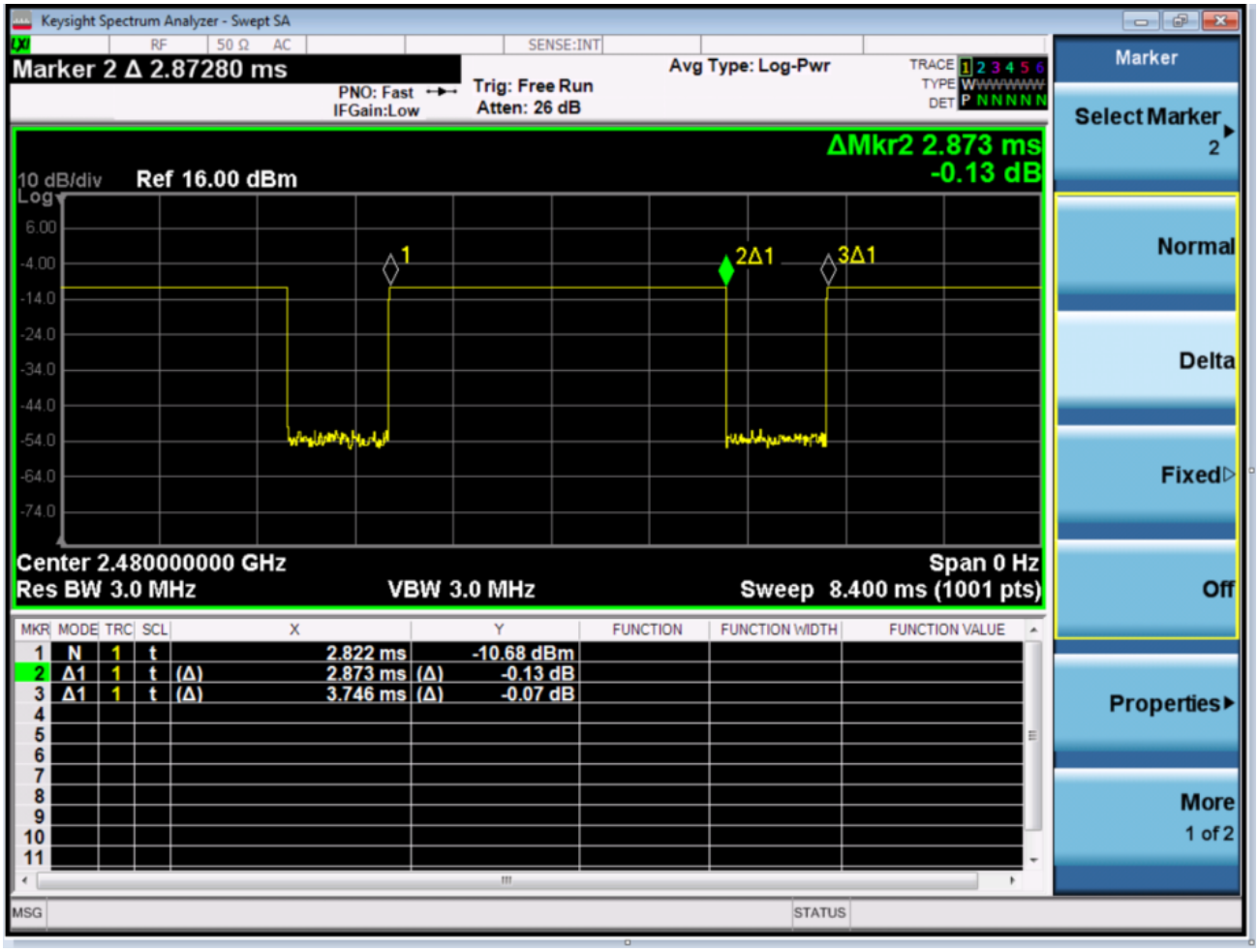


Figure 7-3
Bluetooth Transmission Plot – Antenna WF7 – Variant 2

Equation 7-2
Bluetooth Duty Cycle Calculation

$$Duty\ Cycle = \frac{Pulse\ Width}{Period} * 100\% = \frac{2.873ms}{3.746ms} * 100\% = 76.7\%$$

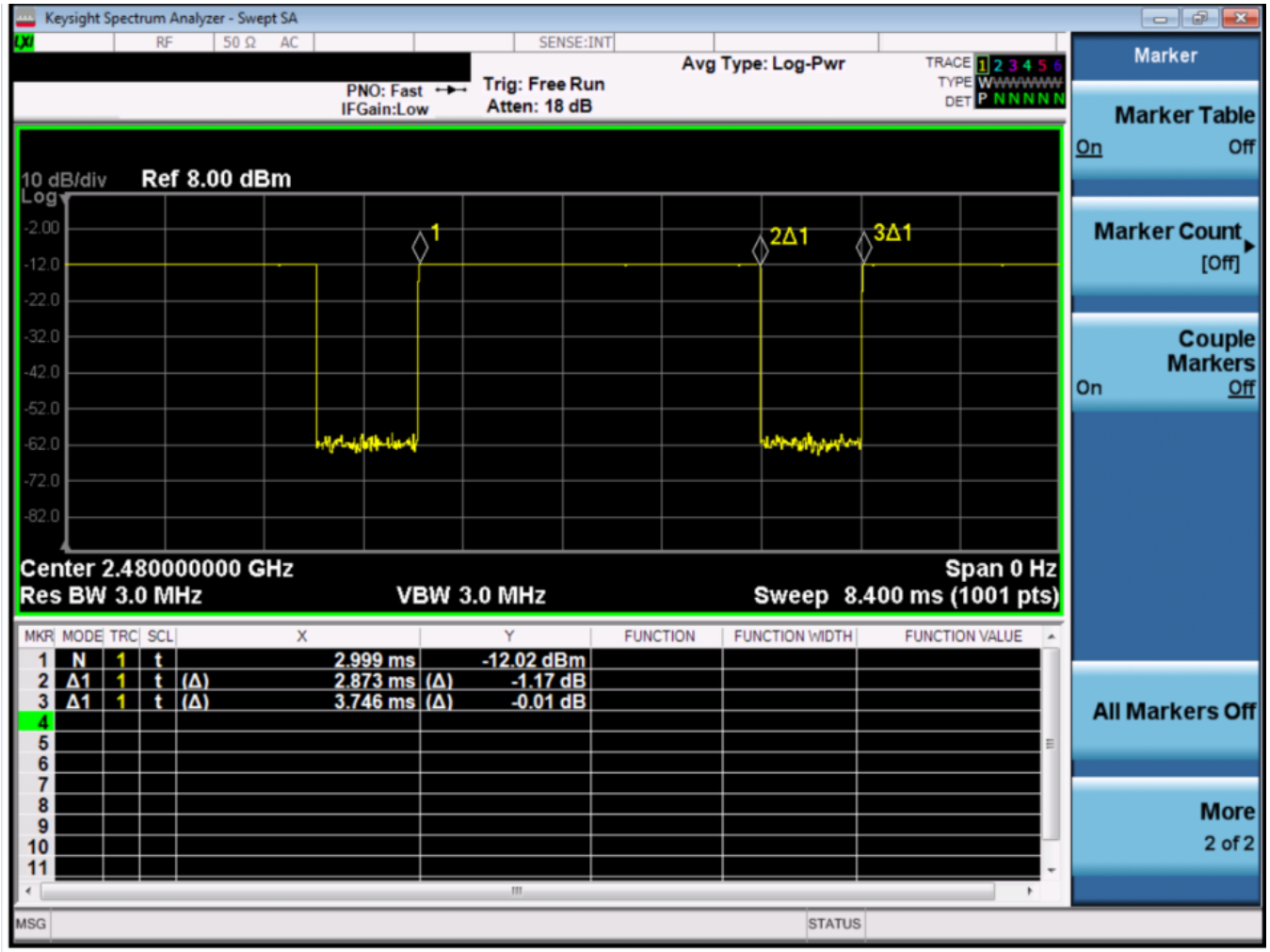


Figure 7-4
Bluetooth Transmission Plot – Antenna WF8 – Variant 1

Equation 7-3
Bluetooth Duty Cycle Calculation

$$Duty\ Cycle = \frac{Pulse\ Width}{Period} * 100\% = \frac{2.873ms}{3.746ms} * 100\% = 76.7\%$$

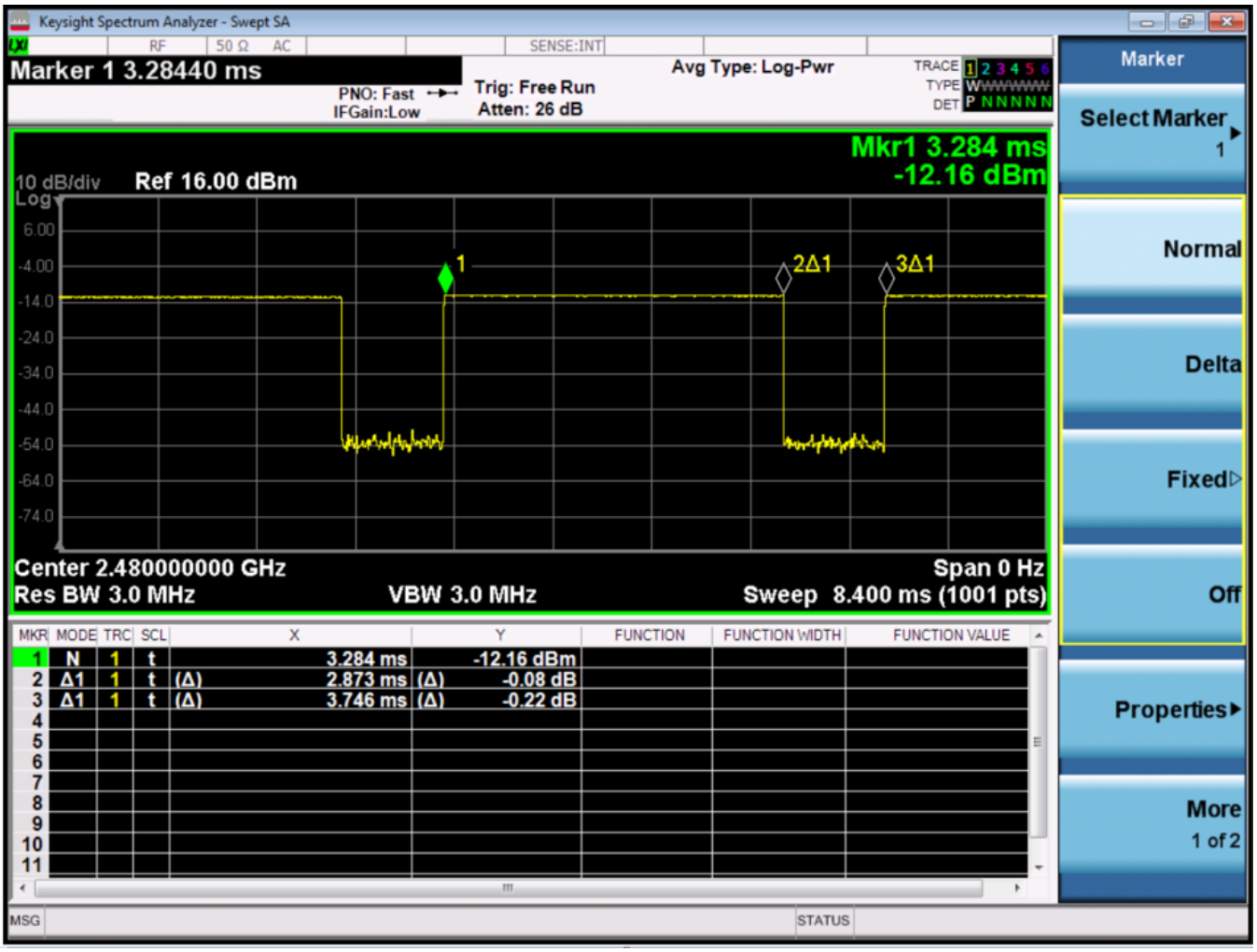


Figure 7-5
Bluetooth Transmission Plot – Antenna WF8 – Variant 2

Equation 7-4
Bluetooth Duty Cycle Calculation

$$Duty\ Cycle = \frac{Pulse\ Width}{Period} * 100\% = \frac{2.873ms}{3.746ms} * 100\% = 76.7\%$$

7.4 Notes for Bluetooth

- The Bluetooth chipset in this device is produced by two different suppliers. The electrically identical modules are manufactured with the identical mechanical structure to meet the same specifications and functions. Two device variants are referenced as Variant 1 and Variant 2 in this report.
- Bluetooth SAR worst case configuration was spotchecked on Variant 1 and Variant 2.
- Full power measurements were performed for Variant 1 and Variant 2 per FCC KDB Procedures 248227.

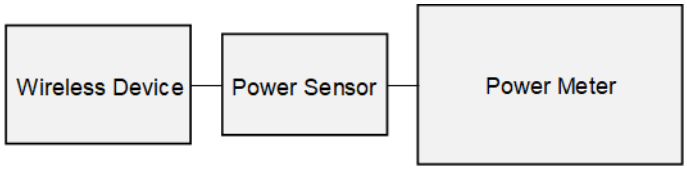


Figure 7-6
Power Measurement Setup

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
06/13/2021	2450 Body	22	2400	1.988	52.493	1.902	52.767	4.52%	-0.52%
			2450	2.031	52.424	1.950	52.700	4.15%	-0.52%
			2480	2.059	52.440	1.993	52.662	3.31%	-0.42%
			2500	2.077	52.461	2.021	52.636	2.77%	-0.33%
07/29/2021	2450 Body	21	2400	1.946	51.447	1.902	52.767	2.31%	-2.50%
			2450	1.992	51.397	1.950	52.700	2.15%	-2.47%
			2480	2.017	51.353	1.993	52.662	1.20%	-2.49%
			2500	2.035	51.327	2.021	52.636	0.69%	-2.49%
08/02/2021	5200-5800 Body	22.5	5180	5.316	48.355	5.276	49.041	0.76%	-1.40%
			5190	5.332	48.329	5.288	49.028	0.83%	-1.43%
			5200	5.348	48.309	5.299	49.014	0.92%	-1.44%
			5210	5.362	48.301	5.311	49.001	0.96%	-1.43%
			5220	5.374	48.290	5.323	48.987	0.96%	-1.42%
			5240	5.405	48.266	5.346	48.960	1.10%	-1.42%
			5250	5.420	48.245	5.358	48.947	1.16%	-1.43%
			5260	5.435	48.236	5.369	48.933	1.23%	-1.42%
			5270	5.449	48.224	5.381	48.919	1.26%	-1.42%
			5280	5.463	48.197	5.393	48.906	1.30%	-1.45%
			5290	5.477	48.171	5.404	48.892	1.35%	-1.47%
			5300	5.489	48.141	5.416	48.879	1.35%	-1.51%
			5310	5.504	48.130	5.428	48.865	1.40%	-1.50%
			5320	5.519	48.116	5.439	48.851	1.47%	-1.50%
			5500	5.761	47.744	5.650	48.607	1.96%	-1.78%
			5510	5.775	47.724	5.661	48.594	2.01%	-1.79%
			5520	5.789	47.709	5.673	48.580	2.04%	-1.79%
			5530	5.806	47.696	5.685	48.566	2.13%	-1.79%
			5540	5.822	47.668	5.696	48.553	2.21%	-1.82%
			5550	5.834	47.638	5.708	48.539	2.21%	-1.86%
			5560	5.846	47.610	5.720	48.526	2.20%	-1.89%
			5580	5.880	47.572	5.743	48.499	2.39%	-1.91%
			5600	5.910	47.539	5.766	48.471	2.50%	-1.92%
			5610	5.925	47.526	5.778	48.458	2.54%	-1.92%
			5620	5.941	47.503	5.790	48.444	2.61%	-1.94%
			5640	5.971	47.462	5.813	48.417	2.72%	-1.97%
			5660	6.004	47.431	5.837	48.390	2.86%	-1.98%
			5670	6.019	47.417	5.848	48.376	2.92%	-1.98%
			5680	6.034	47.399	5.860	48.363	2.97%	-1.99%
			5690	6.051	47.377	5.872	48.349	3.05%	-2.01%
			5700	6.068	47.357	5.883	48.336	3.14%	-2.03%
			5710	6.083	47.346	5.895	48.322	3.19%	-2.02%
			5720	6.099	47.332	5.907	48.309	3.25%	-2.02%
			5745	6.137	47.300	5.936	48.275	3.39%	-2.02%
			5750	6.143	47.295	5.942	48.268	3.38%	-2.02%
			5755	6.152	47.293	5.947	48.261	3.45%	-2.01%
			5765	6.169	47.285	5.959	48.248	3.52%	-2.00%
			5775	6.185	47.268	5.971	48.234	3.58%	-2.00%
			5785	6.201	47.252	5.982	48.220	3.66%	-2.01%
			5795	6.214	47.237	5.994	48.207	3.67%	-2.01%
			5800	6.221	47.225	6.000	48.200	3.68%	-2.02%
			5805	6.229	47.216	6.006	48.193	3.71%	-2.03%
			5825	6.260	47.177	6.029	48.166	3.83%	-2.05%

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.

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 Appendix D.

Table 8-2
System Verification Results

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Source SN	Probe SN	Measured SAR_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	$Deviation_{1g}$ (%)
AM2	2450	BODY	06/13/2021	23.1	22.3	0.100	750	7532	5.050	51.000	50.500	-0.98%
AM2	2450	BODY	07/29/2021	21.8	21.2	0.100	921	7532	5.230	50.800	52.300	2.95%
AM9	5250	BODY	08/02/2021	22.6	20.6	0.050	1123	7638	3.760	73.500	75.200	2.31%
AM9	5600	BODY	08/02/2021	22.6	20.6	0.050	1123	7638	3.760	77.400	75.200	-2.84%
AM9	5750	BODY	08/02/2021	22.6	20.6	0.050	1123	7638	3.830	73.100	76.600	4.79%

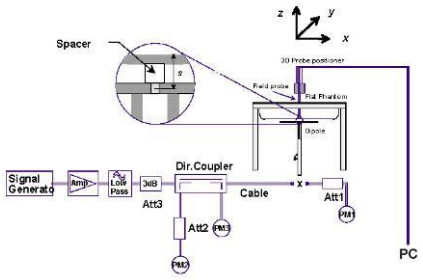


Figure 8-1
System Verification Setup Diagram

Figure 8-2
System Verification Setup Photo

9 SAR DATA SUMMARY

9.1 Standalone Body SAR Data

Table 9-1
2.4 GHz WLAN Body SAR Data – Antenna WF7

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Variant	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.														(W/kg)			(W/kg)	(W/kg)	(W/kg)	
2437	6	802.11b	DSSS	22	20.25	19.60	0.00	0 mm	Ant WF7	V1	C4KQX301VY	1	back	99.7	0.066	1.161	1.003	0.077	0.037	0.043	
2422	3	802.11b	DSSS	22	20.25	19.55	-0.03	0 mm	Ant WF7	V1	C4KQX301VY	1	top	99.7	0.519	1.175	1.003	0.612	0.222	0.262	
2437	6	802.11b	DSSS	22	20.25	19.60	0.03	0 mm	Ant WF7	V1	C4KQX301VY	1	top	99.7	0.584	1.161	1.003	0.680	0.249	0.290	
2462	11	802.11b	DSSS	22	20.25	19.53	0.05	0 mm	Ant WF7	V1	C4KQX301VY	1	top	99.7	0.638	1.180	1.003	0.755	0.270	0.320	
2462	11	802.11b	DSSS	22	20.25	19.47	0.00	0 mm	Ant WF7	V2	FL9HHH7YWH	1	top	99.6	0.628	1.197	1.004	0.755	0.265	0.318	
2437	6	802.11b	DSSS	22	20.25	19.60	-0.07	0 mm	Ant WF7	V1	C4KQX301VY	1	bottom	99.7	0.008	1.161	1.003	0.009	0.003	0.003	
2437	6	802.11b	DSSS	22	20.25	19.60	0.04	0 mm	Ant WF7	V1	C4KQX301VY	1	right	99.7	0.000	1.161	1.003	0.000	0.000	0.000	
2437	6	802.11b	DSSS	22	20.25	19.60	0.03	0 mm	Ant WF7	V1	C4KQX301VY	1	left	99.7	0.109	1.161	1.003	0.127	0.048	0.056	
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
2.4 GHz WLAN Body SAR Data – Antenna WF8

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Variant	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.														(W/kg)			(W/kg)	(W/kg)	(W/kg)	
2422	3	802.11b	DSSS	22	20.25	19.29	0.05	0 mm	Ant WF8	V1	C4KQX301VY	1	back	99.7	0.094	1.247	1.003	0.118	0.047	0.059	
2422	3	802.11b	DSSS	22	20.25	19.29	-0.13	0 mm	Ant WF8	V1	C4KQX301VY	1	top	99.7	0.640	1.247	1.003	0.800	0.293	0.366	
2422	3	802.11b	DSSS	22	20.25	19.28	-0.01	0 mm	Ant WF8	V2	FL9HHH7YWH	1	top	99.6	0.580	1.250	1.004	0.728	0.268	0.336	
2437	6	802.11b	DSSS	22	20.25	19.25	0.03	0 mm	Ant WF8	V1	C4KQX301VY	1	top	99.7	0.662	1.259	1.003	**0.836**	0.308	0.389	A1
2462	11	802.11b	DSSS	22	20.25	19.26	-0.03	0 mm	Ant WF8	V1	C4KQX301VY	1	top	99.7	0.619	1.256	1.003	0.780	0.286	0.360	
2422	3	802.11b	DSSS	22	20.25	19.29	-0.11	0 mm	Ant WF8	V1	C4KQX301VY	1	bottom	99.7	0.024	1.247	1.003	0.030	0.010	0.013	
2422	3	802.11b	DSSS	22	20.25	19.29	0.00	0 mm	Ant WF8	V1	C4KQX301VY	1	right	99.7	0.070	1.247	1.003	0.088	0.032	0.040	
2422	3	802.11b	DSSS	22	20.25	19.29	0.12	0 mm	Ant WF8	V1	C4KQX301VY	1	left	99.7	0.005	1.247	1.003	0.006	0.002	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												

Table 9-3
5 GHz WLAN Body SAR Data – Antenna WF5T

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Variant	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g) (W/kg)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g) (W/kg)	SAR (10g) (W/kg)	Reported SAR (10g) (W/kg)	Plot #
MHz	Ch.																				
5270	54	802.11n	OFDM	40	15.50	14.50	0.02	0 mm	Ant WF5T	V1	C4KQX301VY	13.5	back	98.0	0.057	1.259	1.020	0.073	0.021	0.027	
5270	54	802.11n	OFDM	40	15.50	14.50	0.18	0 mm	Ant WF5T	V1	C4KQX301VY	13.5	top	98.0	0.000	1.259	1.020	0.000	0.000	0.000	
5270	54	802.11n	OFDM	40	15.50	14.50	0.10	0 mm	Ant WF5T	V1	C4KQX301VY	13.5	bottom	98.0	0.000	1.259	1.020	0.000	0.000	0.000	
5270	54	802.11n	OFDM	40	15.50	14.50	0.06	0 mm	Ant WF5T	V1	C4KQX301VY	13.5	right	98.0	0.807	1.259	1.020	1.036	0.204	0.262	
5270	54	802.11n	OFDM	40	15.50	14.47	-0.04	0 mm	Ant WF5T	V2	FL9HHH7YWH	13.5	right	97.9	0.792	1.268	1.021	1.025	0.197	0.255	
5310	62	802.11n	OFDM	40	15.00	13.55	-0.16	0 mm	Ant WF5T	V1	C4KQX301VY	13.5	right	98.0	0.650	1.396	1.020	0.926	0.167	0.238	
5270	54	802.11n	OFDM	40	15.50	14.50	0.21	0 mm	Ant WF5T	V1	C4KQX301VY	13.5	left	98.0	0.006	1.259	1.020	0.008	0.001	0.001	
5610	122	802.11ac	OFDM	80	14.75	13.76	-0.06	0 mm	Ant WF5T	V2	FL9HHH7YWH	29.3	back	95.8	0.057	1.256	1.044	0.075	0.017	0.022	
5610	122	802.11ac	OFDM	80	14.75	13.76	0.04	0 mm	Ant WF5T	V2	FL9HHH7YWH	29.3	top	95.8	0.000	1.256	1.044	0.000	0.000	0.000	
5610	122	802.11ac	OFDM	80	14.75	13.76	0.13	0 mm	Ant WF5T	V2	FL9HHH7YWH	29.3	bottom	95.8	0.000	1.256	1.044	0.000	0.000	0.000	
5530	106	802.11ac	OFDM	80	13.75	11.83	0.07	0 mm	Ant WF5T	V2	FL9HHH7YWH	29.3	right	95.8	0.446	1.556	1.044	0.725	0.107	0.174	
5610	122	802.11ac	OFDM	80	14.75	13.76	-0.04	0 mm	Ant WF5T	V2	FL9HHH7YWH	29.3	right	95.8	0.855	1.256	1.044	1.121	0.214	0.281	
5610	122	802.11ac	OFDM	80	14.75	13.74	-0.01	0 mm	Ant WF5T	V1	C4KQX301VY	29.3	right	95.7	0.842	1.262	1.045	1.110	0.212	0.280	
5690	138	802.11ac	OFDM	80	14.75	13.75	-0.11	0 mm	Ant WF5T	V2	FL9HHH7YWH	29.3	right	95.8	0.889	1.259	1.044	1.168	0.233	0.306	
5610	122	802.11ac	OFDM	80	14.75	13.76	0.04	0 mm	Ant WF5T	V2	FL9HHH7YWH	29.3	left	95.8	0.014	1.256	1.044	0.018	0.000	0.000	
5775	155	802.11ac	OFDM	80	14.50	13.66	-0.03	0 mm	Ant WF5T	V2	FL9HHH7YWH	29.3	back	95.8	0.093	1.213	1.044	0.118	0.033	0.042	
5775	155	802.11ac	OFDM	80	14.50	13.66	-0.09	0 mm	Ant WF5T	V2	FL9HHH7YWH	29.3	top	95.8	0.005	1.213	1.044	0.006	0.000	0.000	
5775	155	802.11ac	OFDM	80	14.50	13.66	-0.10	0 mm	Ant WF5T	V2	FL9HHH7YWH	29.3	bottom	95.8	0.000	1.213	1.044	0.000	0.000	0.000	
5775	155	802.11ac	OFDM	80	14.50	13.72	-0.03	0 mm	Ant WF5T	V1	C4KQX301VY	29.3	right	95.7	0.823	1.197	1.045	1.029	0.214	0.268	
5775	155	802.11ac	OFDM	80	14.50	13.66	-0.09	0 mm	Ant WF5T	V2	FL9HHH7YWH	29.3	right	95.8	0.929	1.213	1.044	**1.176**	0.242	0.306	
5775	155	802.11ac	OFDM	80	14.50	13.66	-0.03	0 mm	Ant WF5T	V2	FL9HHH7YWH	29.3	left	95.8	0.017	1.213	1.044	0.022	0.001	0.001	
5775	155	802.11ac	OFDM	80	14.50	13.66	-0.03	0 mm	Ant WF5T	V2	FL9HHH7YWH	29.3	right	95.8	0.795	1.213	1.044	1.007	0.199	0.252	
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 indicates variability measurement.

Table 9-4
5 GHz WLAN Body SAR Data – Antenna WF2

MEASUREMENT RESULTS																						
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Variant	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.														(W/kg)			(W/kg)	(W/kg)	(W/kg)	
5230	46	802.11n	OFDM	40	17.25	16.65	0.03	0 mm	Ant WF2	V2	GQY50XML40	13.5	back	97.9	0.114	1.148	1.021	0.134	0.044	0.052	
5230	46	802.11n	OFDM	40	17.25	16.65	0.05	0 mm	Ant WF2	V2	GQY50XML40	13.5	top	97.9	0.052	1.148	1.021	0.061	0.014	0.016	
5190	38	802.11n	OFDM	40	16.00	14.44	0.02	0 mm	Ant WF2	V2	GQY50XML40	13.5	bottom	97.9	0.712	1.432	1.021	1.041	0.223	0.326	
5230	46	802.11n	OFDM	40	17.25	16.65	0.17	0 mm	Ant WF2	V2	GQY50XML40	13.5	bottom	97.9	1.010	1.148	1.021	**1.184**	0.329	0.386	A2
5230	46	802.11n	OFDM	40	17.25	16.10	0.06	0 mm	Ant WF2	V1	C4KQX301VY	13.5	bottom	97.9	0.873	1.303	1.021	1.161	0.273	0.363	
5230	46	802.11n	OFDM	40	17.25	16.65	0.20	0 mm	Ant WF2	V2	GQY50XML40	13.5	right	97.9	0.198	1.148	1.021	0.232	0.068	0.080	
5230	46	802.11n	OFDM	40	17.25	16.65	-0.05	0 mm	Ant WF2	V2	GQY50XML40	13.5	left	97.9	0.000	1.148	1.021	0.000	0.000	0.000	
5230	46	802.11n	OFDM	40	17.25	16.65	-0.03	0 mm	Ant WF2	V2	GQY50XML40	13.5	bottom	97.9	0.943	1.148	1.021	1.105	0.299	0.350	
5690	138	802.11ac	OFDM	80	17.00	16.17	-0.12	0 mm	Ant WF2	V1	WFN23XMY9V	29.3	back	95.8	0.113	1.211	1.044	0.143	0.041	0.052	
5690	138	802.11ac	OFDM	80	17.00	16.17	-0.02	0 mm	Ant WF2	V1	WFN23XMY9V	29.3	top	95.8	0.029	1.211	1.044	0.037	0.007	0.009	
5530	106	802.11ac	OFDM	80	13.75	11.79	0.03	0 mm	Ant WF2	V1	WFN23XMY9V	29.3	bottom	95.8	0.250	1.570	1.044	0.410	0.079	0.129	
5610	122	802.11ac	OFDM	80	17.00	16.16	-0.05	0 mm	Ant WF2	V2	GQY50XML40	29.3	bottom	95.8	0.845	1.213	1.044	1.070	0.276	0.350	
5610	122	802.11ac	OFDM	80	17.00	16.05	-0.10	0 mm	Ant WF2	V1	WFN23XMY9V	29.3	bottom	95.8	0.866	1.245	1.044	1.126	0.291	0.378	
5690	138	802.11ac	OFDM	80	17.00	16.17	0.02	0 mm	Ant WF2	V1	WFN23XMY9V	29.3	bottom	95.8	0.915	1.211	1.044	1.157	0.300	0.379	
5690	138	802.11ac	OFDM	80	17.00	16.17	0.03	0 mm	Ant WF2	V1	WFN23XMY9V	29.3	right	95.8	0.107	1.211	1.044	0.135	0.032	0.040	
5690	138	802.11ac	OFDM	80	17.00	16.17	0.05	0 mm	Ant WF2	V1	WFN23XMY9V	29.3	left	95.8	0.014	1.211	1.044	0.018	0.003	0.004	
5775	155	802.11ac	OFDM	80	16.50	15.64	0.03	0 mm	Ant WF2	V1	WFN23XMY9V	29.3	back	95.8	0.126	1.219	1.044	0.160	0.049	0.062	
5775	155	802.11ac	OFDM	80	16.50	15.64	0.11	0 mm	Ant WF2	V1	WFN23XMY9V	29.3	top	95.8	0.007	1.219	1.044	0.009	0.001	0.001	
5775	155	802.11ac	OFDM	80	16.50	15.64	0.03	0 mm	Ant WF2	V1	WFN23XMY9V	29.3	bottom	95.8	0.919	1.219	1.044	1.170	0.310	0.395	
5775	155	802.11ac	OFDM	80	16.50	15.40	-0.19	0 mm	Ant WF2	V2	GQY50XML40	29.3	bottom	95.8	0.735	1.288	1.044	0.988	0.241	0.324	
5775	155	802.11ac	OFDM	80	16.50	15.64	0.06	0 mm	Ant WF2	V1	WFN23XMY9V	29.3	right	95.8	0.156	1.219	1.044	0.199	0.054	0.069	
5775	155	802.11ac	OFDM	80	16.50	15.64	0.00	0 mm	Ant WF2	V1	WFN23XMY9V	29.3	left	95.8	0.001	1.219	1.044	0.001	0.000	0.000	
5610	122	802.11ac	OFDM	80	17.00	16.05	-0.01	0 mm	Ant WF2	V1	WFN23XMY9V	29.3	bottom	95.8	0.836	1.245	1.044	1.087	0.278	0.361	
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 indicates variability measurement.

Table 9-5
Bluetooth Body SAR Data – Antenna WF7

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Variant	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Cond Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.													(W/kg)			(W/kg)	(W/kg)	(W/kg)	
2480	78	Bluetooth	FHSS	19.50	18.58	-0.01	0 mm	Ant WF7	V2	FL9HHH7YWH	1	back	76.7	0.068	1.236	1.010	0.085	0.036	0.044	
2402	0	Bluetooth	FHSS	19.50	18.38	0.12	0 mm	Ant WF7	V2	FL9HHH7YWH	1	top	76.7	0.441	1.294	1.010	0.576	0.186	0.241	
2441	39	Bluetooth	FHSS	19.50	18.33	0.00	0 mm	Ant WF7	V2	FL9HHH7YWH	1	top	76.7	0.510	1.309	1.010	0.674	0.214	0.280	
2480	78	Bluetooth	FHSS	19.50	18.58	0.07	0 mm	Ant WF7	V2	FL9HHH7YWH	1	top	76.7	0.671	1.236	1.010	**0.838**	0.307	0.379	A3
2480	78	Bluetooth	FHSS	19.50	18.55	-0.10	0 mm	Ant WF7	V1	WFN23XMY9V	1	top	76.7	0.626	1.245	1.010	0.787	0.261	0.325	
2480	78	Bluetooth	FHSS	19.50	18.58	-0.04	0 mm	Ant WF7	V2	FL9HHH7YWH	1	bottom	76.7	0.005	1.236	1.010	0.006	0.002	0.002	
2480	78	Bluetooth	FHSS	19.50	18.58	-0.07	0 mm	Ant WF7	V2	FL9HHH7YWH	1	right	76.7	0.002	1.236	1.010	0.002	0.000	0.000	
2480	78	Bluetooth	FHSS	19.50	18.58	-0.04	0 mm	Ant WF7	V2	FL9HHH7YWH	1	left	76.7	0.069	1.236	1.010	0.086	0.030	0.037	
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 the manufacturer.

Table 9-6
Bluetooth Body SAR Data – Antenna WF8

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Variant	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Cond Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.													(W/kg)			(W/kg)	(W/kg)	(W/kg)	
2441	39	Bluetooth	FHSS	17.50	16.61	0.07	0 mm	Ant WF8	V2	FT2VT9HM2V	1	back	76.7	0.036	1.227	1.010	0.045	0.018	0.022	
2402	0	Bluetooth	FHSS	17.50	16.53	0.00	0 mm	Ant WF8	V2	FT2VT9HM2V	1	top	76.7	0.442	1.250	1.010	0.558	0.200	0.250	
2441	39	Bluetooth	FHSS	17.50	16.61	0.02	0 mm	Ant WF8	V2	FT2VT9HM2V	1	top	76.7	0.455	1.227	1.010	0.564	0.207	0.254	
2480	78	Bluetooth	FHSS	17.50	16.19	0.02	0 mm	Ant WF8	V2	FT2VT9HM2V	1	top	76.7	0.331	1.352	1.010	0.452	0.147	0.199	
2480	78	Bluetooth	FHSS	17.50	16.82	0.01	0 mm	Ant WF8	V1	YH5WVC2JDG	1	top	76.7	0.382	1.169	1.010	0.451	0.174	0.203	
2441	39	Bluetooth	FHSS	17.50	16.61	-0.11	0 mm	Ant WF8	V2	FT2VT9HM2V	1	bottom	76.7	0.007	1.227	1.010	0.009	0.002	0.002	
2441	39	Bluetooth	FHSS	17.50	16.61	-0.03	0 mm	Ant WF8	V2	FT2VT9HM2V	1	right	76.7	0.027	1.227	1.010	0.033	0.012	0.015	
2441	39	Bluetooth	FHSS	17.50	16.61	-0.05	0 mm	Ant WF8	V2	FT2VT9HM2V	1	left	76.7	0.002	1.227	1.010	0.002	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 the manufacturer.

9.2 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 D01v06.
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 D01v06.
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 11.1 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 D01v06 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.

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 D01v06 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 see Section 10 for complete analysis.
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. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8 MHz, VBW = 50 MHz, and detector = peak per guidance of Section 6.0 b) of ANSI C63. 10-2013 and KDB 558074 D01 v04. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100.
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 the manufacturer. See Section 7.3 for the time domain plot and calculation for the duty factor of the device.

10 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

10.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v06 are applicable to devices with built-in unlicensed transmitters such as 802.11 and Bluetooth devices which may simultaneously transmit together.

10.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore, simultaneous transmission analysis is required. Per FCC KDB Publication 447498 D01v06 4.3.2 and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is ≤1.6 W/kg. The different test positions in an exposure condition may be considered collectively to determine SAR test exclusion according to the sum of 1g SAR.

10.3 Body SAR Simultaneous Transmission Analysis

Table 10-1
Simultaneous Transmission Scenario with 2.4 GHz WLAN

Simult Tx	Configuration	2.4 GHz WLAN Ant WF7 SAR (W/kg)	2.4 GHz WLAN Ant WF8 SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Body SAR	Back	0.077	0.118	0.195
	Top	0.755	0.836	**1.591**
	Bottom	0.009	0.030	0.039
	Right	0.000	0.088	0.088
	Left	0.127	0.006	0.133

Table 10-2
Simultaneous Transmission Scenario with 2.4 GHz Bluetooth

Simult Tx	Configuration	Bluetooth Ant WF7 SAR (W/kg)	Bluetooth Ant WF8 SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Body SAR	Back	0.085	0.045	0.130
	Top	0.838	0.564	**1.402**
	Bottom	0.006	0.009	0.015
	Right	0.002	0.033	0.035
	Left	0.086	0.002	0.088

Table 10-3
Simultaneous Transmission Scenario with 5 GHz WLAN

Simult Tx	Configuration	5 GHz WLAN Ant WF5T SAR (W/kg)	5 GHz WLAN Ant WF2 SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Body SAR	Back	0.118	0.160	0.278
	Top	0.006	0.061	0.067
	Bottom	0.000	1.184	1.184
	Right	1.176	0.232	**1.408**
	Left	0.022	0.018	0.040

Table 10-4
Simultaneous Transmission Scenario Bluetooth with 5 GHz WLAN

Simult Tx	Configuration	Bluetooth Ant WF7 SAR (W/kg)	Bluetooth Ant WF8 SAR (W/kg)	5 GHz WLAN Ant WF5T SAR (W/kg)	5 GHz WLAN Ant WF2 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	4	1+2+3+4
Body SAR	Back	0.085	0.045	0.118	0.160	0.408
	Top	0.838	0.564	0.006	0.061	**1.469**
	Bottom	0.006	0.009	0.000	1.184	1.199
	Right	0.002	0.033	1.176	0.232	1.443
	Left	0.086	0.002	0.022	0.018	0.128

10.4 Simultaneous Transmission Conclusion

The above numerical summed SAR results for all the worst-case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v06 and IEEE 1528-2013 Section 6.3.4.1.2.

11 SAR MEASUREMENT VARIABILITY

11.1 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

Table 11-1
Body SAR Measurement Variability Results

BODY VARIABILITY RESULTS															
Band	FREQUENCY		Mode	Service	Antenna	Data Rate (Mbps)	Side	Spacing	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	Ratio	3rd Repeated SAR (1g)	Ratio
	MHz	Ch.							(W/kg)	(W/kg)		(W/kg)		(W/kg)	
5250	5230.00	46	802.11n, 40 MHz Bandwidth	OFDM	Ant WF2	13.5	bottom	0 mm	1.010	0.943	1.07	N/A	N/A	N/A	N/A
5600	5610.00	122	802.11ac, 80 MHz Bandwidth	OFDM	Ant WF2	29.3	bottom	0 mm	0.866	0.836	1.04	N/A	N/A	N/A	N/A
5750	5775.00	155	802.11ac, 80 MHz Bandwidth	OFDM	Ant WF5T	29.3	right	0 mm	0.929	0.795	1.17	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram						

11.2 Measurement Uncertainty

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

12 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	4/14/2021	Annual	4/14/2022	US39170118
Agilent	E4438C	ESG Vector Signal Generator	9/29/2020	Annual	9/29/2021	MY45093852
Agilent	E4438C	ESG Vector Signal Generator	12/2/2020	Annual	12/2/2021	MY42081752
Agilent	N5182A	MXG Vector Signal Generator	9/25/2020	Annual	9/25/2021	US46240505
Agilent	N5182A	MXG Vector Signal Generator	12/1/2020	Annual	12/1/2021	MY47420837
Agilent	N9020A	MXA Signal Analyzer	12/21/2020	Annual	12/21/2021	MY50200571
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343971
Anritsu	MA24106A	USB Power Sensor	9/15/2020	Annual	9/15/2021	1244515
Anritsu	MA24106A	USB Power Sensor	9/15/2020	Annual	9/15/2021	1248508
Anritsu	MA2411B	Pulse Power Sensor	3/8/2021	Annual	3/8/2022	1339007
Anritsu	ML2495A	Power Meter	11/3/2020	Annual	11/3/2021	1039008
Anritsu	ML2496A	Power Meter	2/19/2021	Annual	2/19/2022	1138001
Control Company	4353	Long Stem Thermometer	10/28/2020	Biennial	10/28/2022	200670646
Control Company	4353	Long Stem Thermometer	10/28/2020	Biennial	10/28/2022	200670653
HEWLETT PACKARD	8753E	Network Analyzer	12/10/2020	Annual	12/10/2021	US38161081
SPEAG	D2450V2	2450 MHz SAR Dipole	6/14/2019	Triennial	6/14/2022	750
SPEAG	D2450V2	2450 MHz SAR Dipole	11/12/2018	Triennial	11/12/2021	921
SPEAG	D5GHzV2	5 GHz SAR Dipole	3/10/2021	Annual	3/10/2022	1123
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/11/2021	Annual	1/11/2022	1644
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/13/2021	Annual	4/13/2022	501
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/12/2021	Annual	5/12/2022	1070
SPEAG	EX3DV4	SAR Probe	4/19/2021	Annual	4/19/2022	7532
SPEAG	EX3DV4	SAR Probe	3/3/2021	Annual	3/3/2022	7638
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	N/A
Mini-Circuits	ZHDC-16-63-S+	50-6000MHz Bidirectional Coupler	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Control Company	4040	Therm./ Clock/ Humidity Monitor	3/12/2021	Biennial	3/12/2023	210202151
Control Company	4040	Therm./ Clock/ Humidity Monitor	2/19/2021	Biennial	2/19/2023	210114805
Rohde & Schwarz	FSP-7	Spectrum Analyzer	1/9/2020	Biennial	1/9/2022	100990

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.

13 MEASUREMENT UNCERTAINTIES

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

14 CONCLUSION

14.1 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]

15 REFERENCES

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, Aug. 1996.

[2] ANSI/IEEE C95.1-2005, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, 2006.

[3] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, Sept. 1992.

[4] ANSI/IEEE C95.3-2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, December 2002.

[5] IEEE Standards Coordinating Committee 39 –Standards Coordinating Committee 34 – IEEE Std. 1528-2013, IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

[6] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for RadioFrequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.

[7] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.

[8] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 1 -124.

[9] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.

[10] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.

[11] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.

[12] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.

[13] G. Hartsgrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.

[14] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.

[15] W. Gander, Computermathematick, Birkhaeuser, Basel, 1992.

[16] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.

[17] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

REV 21.4 M
09/11/2019

[18] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10kHz-300GHz, Jan. 1995.

[19] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hoschschule Zürich, Dosimetric Evaluation of the Cellular Phone.

[20] IEC 62209-1, Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1: Devices used next to the ear (Frequency range of 300 MHz to 6 GHz), July 2016.

[21] Innovation, Science, Economic Development Canada RSS-102 Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Issue 5, March 2015.

[22] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range from 3 kHz – 300 GHz, 2015

[23] FCC SAR Test Procedures for 2G-3G Devices, Mobile Hotspot and UMPC Devices KDB Publications 941225, D01-D07

[24] SAR Measurement Guidance for IEEE 802.11 Transmitters, KDB Publication 248227 D01

[25] FCC SAR Considerations for Handsets with Multiple Transmitters and Antennas, KDB Publications 648474 D03-D04

[26] FCC SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers, FCC KDB Publication 616217 D04

[27] FCC SAR Measurement and Reporting Requirements for 100MHz – 6 GHz, KDB Publications 865664 D01-D02

[28] FCC General RF Exposure Guidance and SAR Procedures for Dongles, KDB Publication 447498, D01-D02

[29] Anexo à Resolução No. 533, de 10 de Septembro de 2009.

[30] IEC 62209-2, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz), Mar. 2010.

15 REFERENCES

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, Aug. 1996.

[2] ANSI/IEEE C95.1-2005, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, 2006.

[3] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, Sept. 1992.

[4] ANSI/IEEE C95.3-2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, December 2002.

[5] IEEE Standards Coordinating Committee 39 –Standards Coordinating Committee 34 – IEEE Std. 1528-2013, IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

[6] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for RadioFrequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.

[7] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.

[8] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 1 -124.

[9] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.

[10] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.

[11] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.

[12] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.

[13] G. Hartsgrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.

[14] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.

[15] W. Gander, Computermathematick, Birkhaeuser, Basel, 1992.

[16] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.

[17] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

REV 21.4 M
09/11/2019

[18] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10kHz-300GHz, Jan. 1995.

[19] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hoschschule Zürich, Dosimetric Evaluation of the Cellular Phone.

[20] IEC 62209-1, Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1: Devices used next to the ear (Frequency range of 300 MHz to 6 GHz), July 2016.

[21] Innovation, Science, Economic Development Canada RSS-102 Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Issue 5, March 2015.

[22] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range from 3 kHz – 300 GHz, 2015

[23] FCC SAR Test Procedures for 2G-3G Devices, Mobile Hotspot and UMPC Devices KDB Publications 941225, D01-D07

[24] SAR Measurement Guidance for IEEE 802.11 Transmitters, KDB Publication 248227 D01

[25] FCC SAR Considerations for Handsets with Multiple Transmitters and Antennas, KDB Publications 648474 D03-D04

[26] FCC SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers, FCC KDB Publication 616217 D04

[27] FCC SAR Measurement and Reporting Requirements for 100MHz – 6 GHz, KDB Publications 865664 D01-D02

[28] FCC General RF Exposure Guidance and SAR Procedures for Dongles, KDB Publication 447498, D01-D02

[29] Anexo à Resolução No. 533, de 10 de Septembro de 2009.

[30] IEC 62209-2, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz), Mar. 2010.

APPENDIX A: SAR TEST DATA

PCTEST

DUT: BCGA2567; Type: Tablet Device; Serial: C4KQX301VY

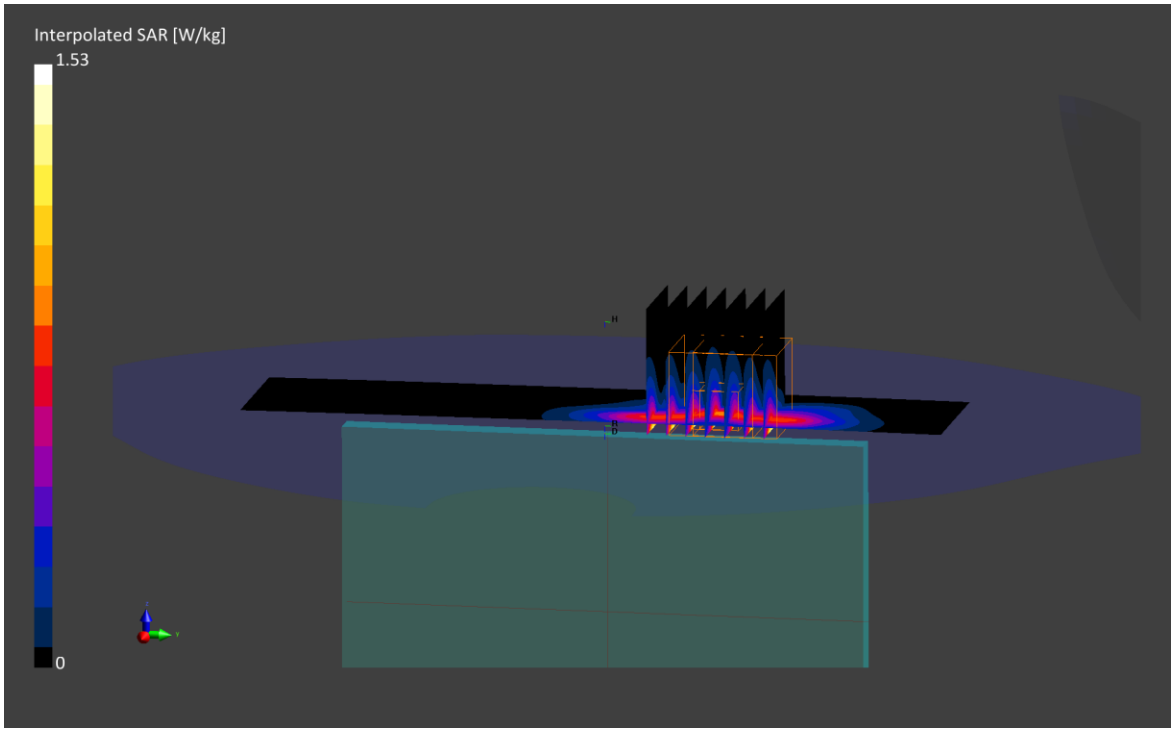
Communication System: UID:10415-AAA, WLAN; MAIA: Y; Frequency: 2437.0 MHz
Medium: 2450 Body; Medium parameters used:
f = 2437.0 MHz; cond = 2.02 S/m; perm = 52.4; density = 1000 kg/m3
Phantom Section: Flat; Space: 0.0 mm

Test Date: 06/13/2021; Ambient Temp: 23.1°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7532; ConvF:(7.64,7.64,7.64); Calibrated: 2021-04-19
Sensor-Surface: 1.4mm (VMS + 6p)
Electronics: DAE4 Sn501; Calibrated: 2021-04-13
Phantom: Left; Serial: 1275
Measurement SW: cDASY6 Module SAR V6.14.0.959

Mode: IEEE 802.11b, Antenna WF8, Variant 1, 22 MHz Bandwidth, Body SAR, Top Edge, Ch 6, 1 Mbps

Area Scan (40.0 x 180.0): Measurement grid: dx=5.0 mm, dy=10.0 mm
Zoom Scan (30.0 x 30.0 x 30.0): Measurement grid: dx=5.0 mm, dy=5.0 mm, dz=1.5 mm; Graded Ratio: 1.5
Reference Value = 0.87 W/kg; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.53 W/kg
SAR(1 g) = 0.662 W/kg; SAR(10 g) = 0.308 W/kg
Smallest distance from peaks to all points 3 dB below is 7.0 mm
Ratio of SAR at M2 to SAR at M1 = 77.5 %



PCTEST

DUT: BCGA2567; Type: Tablet Device; Serial: GQY50XML40

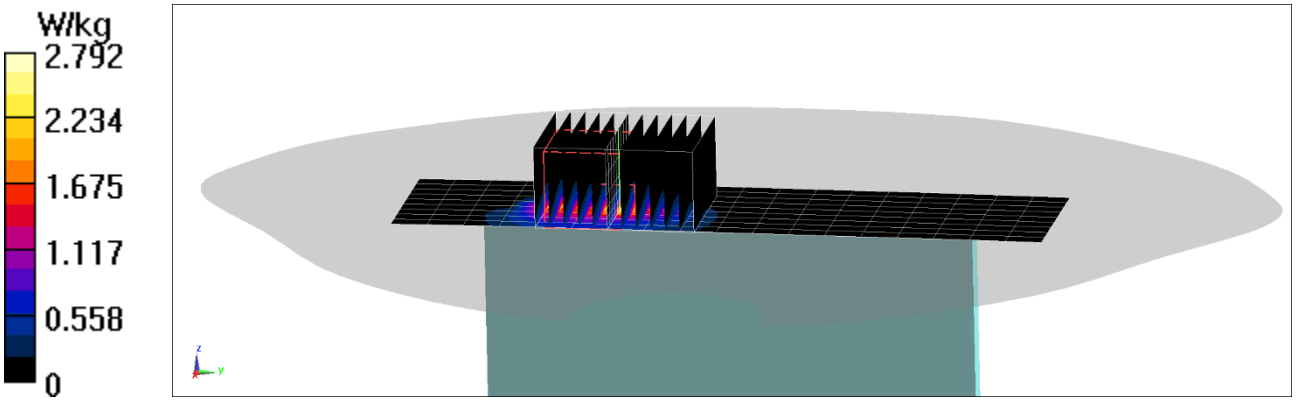
Communication System: UID 10117 - CAD,
IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK); Frequency: 5230 MHz
Medium: 5200-5800 Body; Medium parameters used (interpolated):
f = 5230 MHz; σ = 5.39 S/m; ε_r = 48.278; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 mm

Test Date: 08/02/2021; Ambient Temp: 22.6°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7638; ConvF(4.76, 4.76, 4.76) @ 5230 MHz; Calibrated: 3/3/2021
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1644; Calibrated: 1/11/2021
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 2027
Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7495)

Mode: IEEE 802.11n, Antenna WF2, Variant 2, U-NII-1, 40 MHz Bandwidth, Body SAR, Ch 46, 13.5 Mbps, Bottom Edge

Area Scan (10x19x1): Measurement grid: dx=5mm, dy=10mm
Zoom Scan (10x10x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Reference Value = 15.24 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 4.75 W/kg
SAR(1 g) = 1.01 W/kg; SAR(10 g) = 0.329 W/kg
Smallest distance from peaks to all points 3 dB below = 5.6 mm
Ratio of SAR at M2 to SAR at M1 = 61.3%



PCTEST

DUT: BCGA2567; Type: Tablet Device; Serial: FL9HHH7YWH

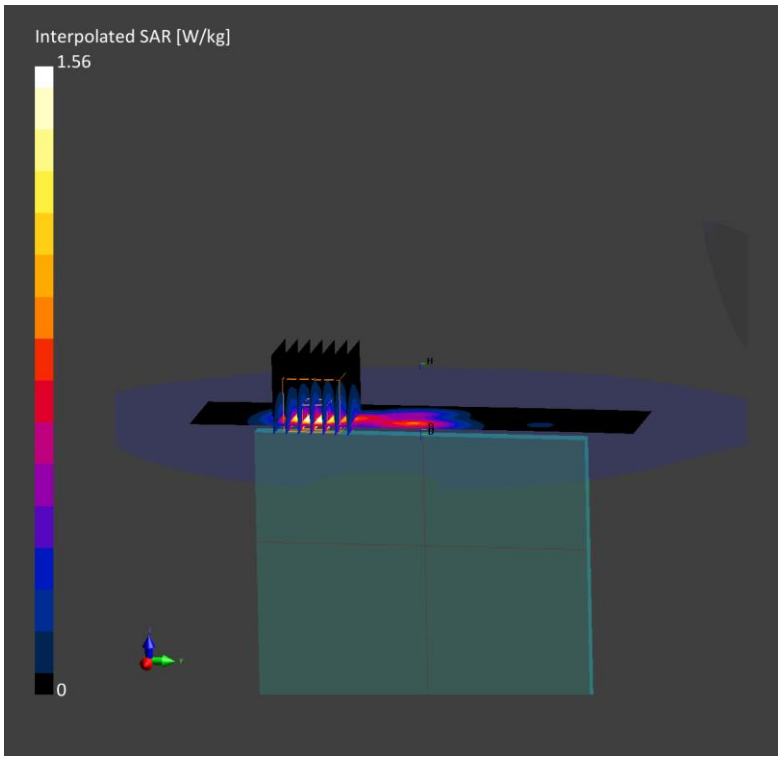
Communication System: UID:10032-CAA, Bluetooth; MAIA: Y; Frequency: 2480.0 MHz
Medium: 2450 Body; Medium parameters used:
f = 2480.0 MHz; cond = 2.02 S/m; perm = 51.4; density = 1000 kg/m3
Phantom Section: Flat; Space: 0.0 mm

Test Date: 07/29/2021; Ambient Temp: 21.8°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN7532; ConvF:(7.64,7.64,7.64); Calibrated: 2021-04-19
Sensor-Surface: 1.4mm (VMS + 6p)
Electronics: DAE4 Sn501; Calibrated: 2021-04-13
Phantom: Twin-SAM V4.0; Serial: 1275
Measurement SW: cDASY6 Module SAR V6.14.0.959

Mode: Bluetooth, Antenna WF7, Variant 2, Body SAR, Ch.78, 1 Mbps, Top Edge

Area Scan (40.0 x 180.0): Measurement grid: dx=5.0 mm, dy=10.0 mm
Zoom Scan (30.0 x 30.0 x 30.0): Measurement grid: dx=5.0 mm, dy=5.0 mm, dz=1.5 mm; Graded Ratio: 1.5
Reference Value = 0.92 W/kg; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 1.56 W/kg
SAR(1 g) = 0.671 W/kg; SAR(10 g) = 0.307 W/kg
Smallest distance from peaks to all points 3 dB below is 8.0 mm
Ratio of SAR at M2 to SAR at M1 = 77.1 %



APPENDIX B: SYSTEM VERIFICATION

PCTEST

DUT: Dipole 2450.0 MHz; Type: D2450V2 - SN750

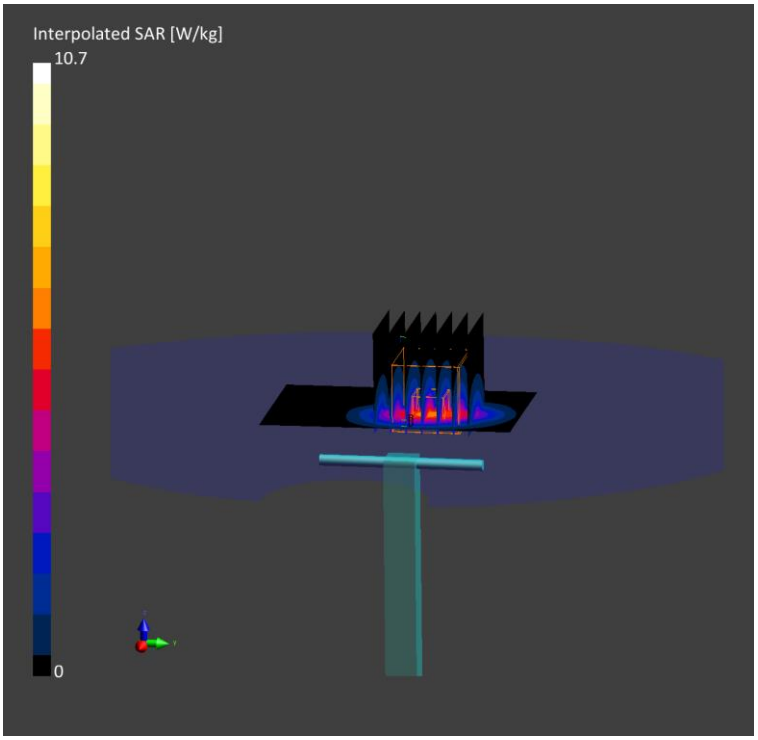
Communication System: UID: 0, CW; Frequency: 2450.0 MHz
Medium: 2450 Body; Medium parameters used:
f = 2450.0 MHz; cond = 2.03 S/m; perm = 52.4; density = 1000 kg/m3
Phantom Section: Flat; Space: 10 mm

Test Date: 06/13/2021; Ambient Temp: 23.1°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7532; ConvF:(7.64,7.64,7.64); Calibrated: 2021-04-19
Sensor-Surface: 1.4mm (VMS + 6p)
Electronics: DAE4 Sn501; Calibrated: 2021-04-13
Phantom: Left; Serial: 1275
Measurement SW: cDASY6 Module SAR V6.14.0.959

2450.0 MHz System Verification at 20.0 dBm

Area Scan (40.0 x 80.0): Measurement grid: dx=10.0mm, dy=10.0mm
Zoom Scan (30.0 x 30.0 x 30.0): Measurement grid: dx=5.0mm, dy=5.0mm, dz=1.5mm; Graded Ratio: 1.5
Peak SAR (extrapolated) = 10.7 W/kg
SAR(1 g) = 5.05 W/kg; SAR(10 g) = 2.31 W/kg
Deviation (1 g) = -0.98%



PCTEST

DUT: Dipole 2450.0 MHz; Type: D2450V2 - SN921

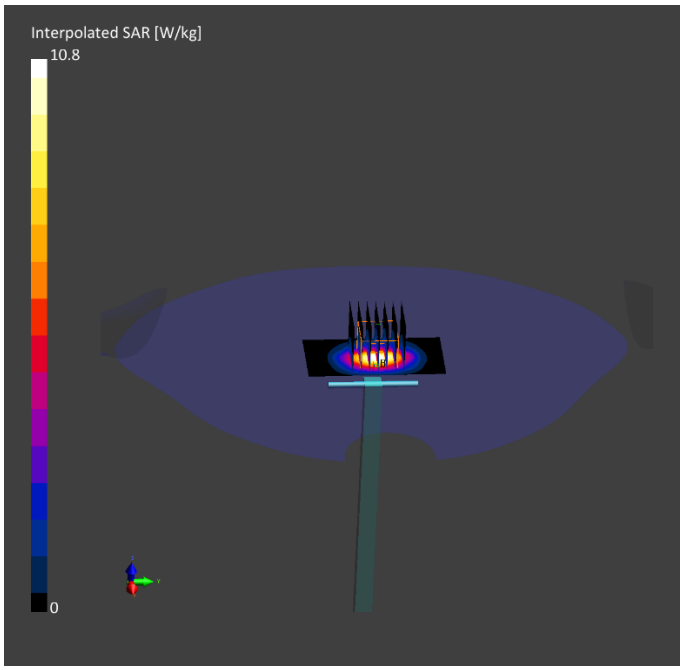
Communication System: UID: 0, CW; Frequency: 2450.0 MHz
Medium: 2450 Body; Medium parameters used:
f = 2450.0 MHz; cond = 1.99 S/m; perm = 51.4; density = 1000 kg/m3
Phantom Section: Flat; Space: 10 mm

Test Date: 07/29/2021; Ambient Temp: 21.8°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN7532; ConvF:(7.64,7.64,7.64); Calibrated: 2021-04-19
Sensor-Surface: 1.4mm (VMS + 6p)
Electronics: DAE4 Sn501; Calibrated: 2021-04-13
Phantom: Twin-SAM V4.0; Serial: 1275
Measurement SW: cDASY6 Module SAR V6.14.0.959

2450.0 MHz System Verification at 20.0 dBm

Area Scan (40.0 x 80.0): Measurement grid: dx=10.0 mm, dy=10.0 mm
Zoom Scan (30.0 x 30.0 x 30.0): Measurement grid: dx=5.0 mm, dy=5.0 mm, dz=1.5 mm; Graded Ratio: 1.5
Peak SAR (extrapolated) = 10.8 W/kg
SAR(1 g) = 5.23 W/kg; SAR(10 g) = 2.44 W/kg
Deviation (1 g) = 2.95%



PCTEST

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1123

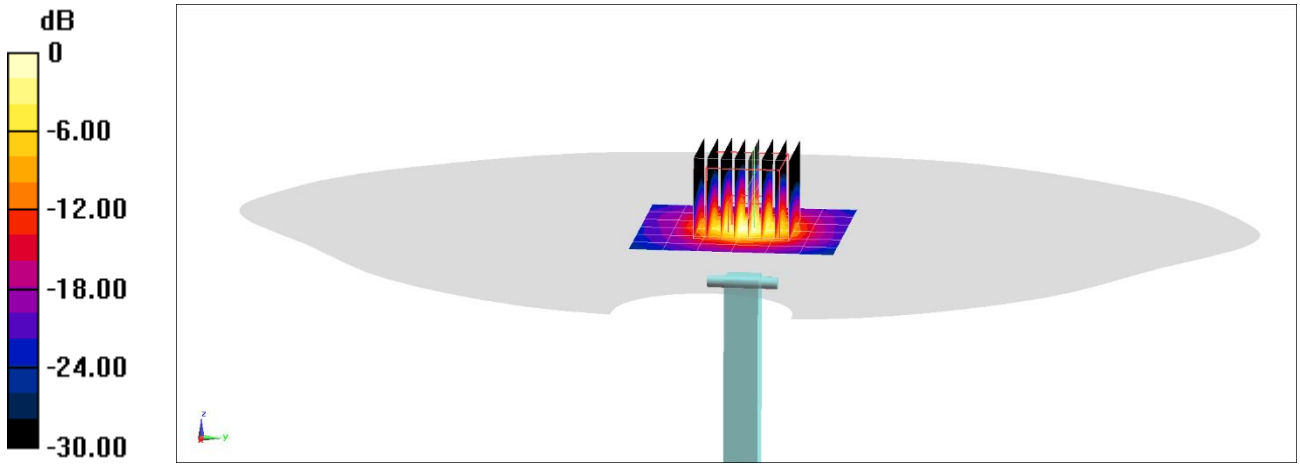
Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1
5200-5800 Body Medium parameters used:
f = 5250 MHz; σ = 5.42 S/m; ε_r = 48.245; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 10 mm

Test Date: 08/02/2021; Ambient Temp: 22.6°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7638; ConvF(4.76, 4.76, 4.76) @ 5250 MHz; Calibrated: 3/3/2021
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1644; Calibrated: 1/11/2021
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 2027
Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7495)

5250 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 15.6 W/kg
SAR(1 g) = 3.76 W/kg; SAR(10 g) = 1.04 W/kg
Deviation(1 g) = 2.31%



0 dB = 9.02 W/kg = 9.55 dBW/kg

PCTEST

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1123

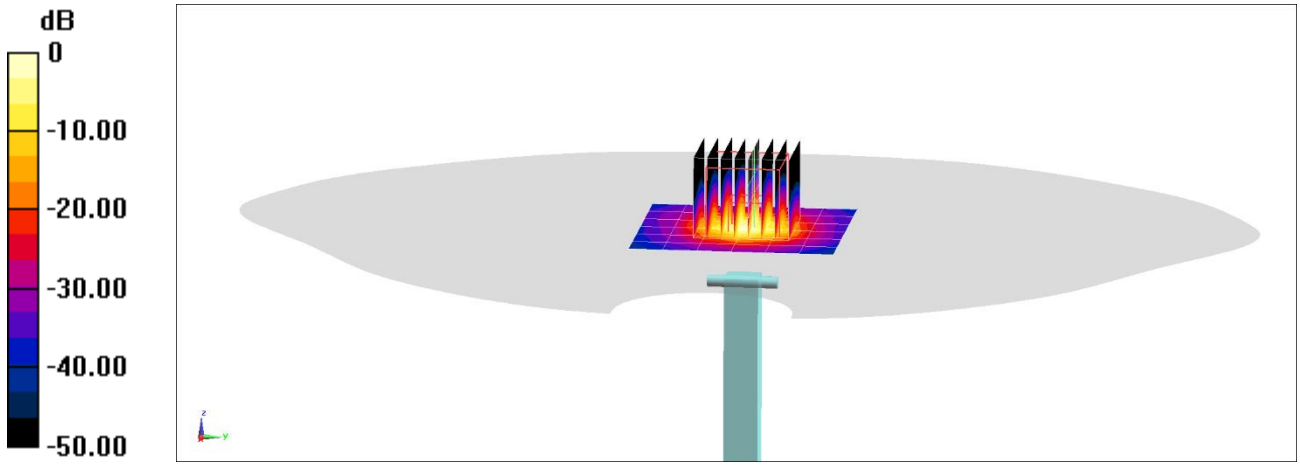
Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1
5200-5800 Body Medium parameters used:
f = 5600 MHz; σ = 5.91 S/m; ε_r = 47.539; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 10 mm

Test Date: 08/02/2021; Ambient Temp: 22.6°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7638; ConvF(4.24, 4.24, 4.24) @ 5600 MHz; Calibrated: 3/3/2021
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1644; Calibrated: 1/11/2021
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 2027
Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7495)

5600 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 17.2 W/kg
SAR(1 g) = 3.76 W/kg; SAR(10 g) = 1.05 W/kg
Deviation(1 g) = -2.84%



0 dB = 9.55 W/kg = 9.80 dBW/kg

PCTEST

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1123

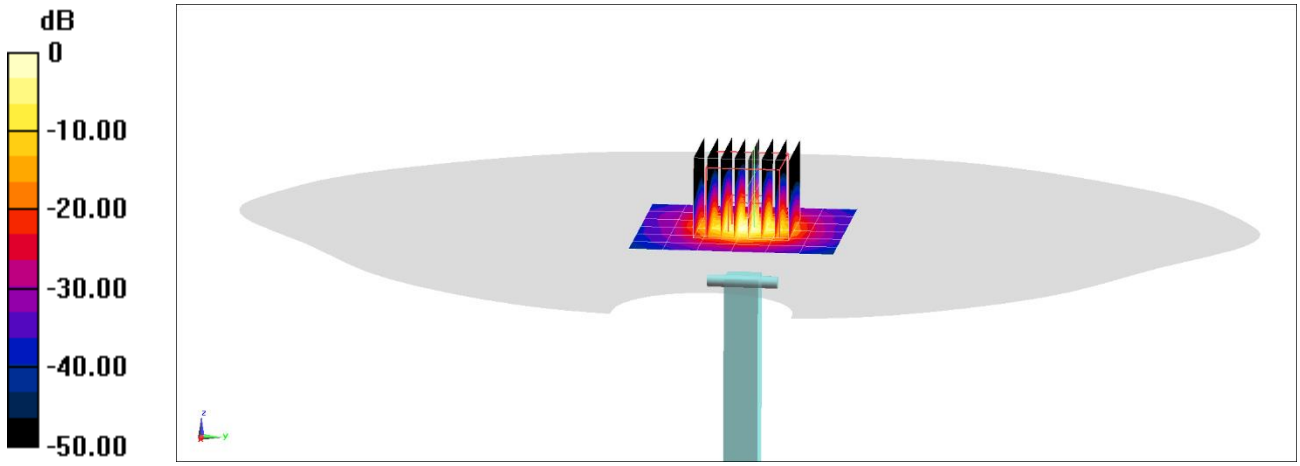
Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1
5200-5800 Body Medium parameters used:
f = 5750 MHz; σ = 6.143 S/m; ε_r = 47.295; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 10 mm

Test Date: 08/02/2021; Ambient Temp: 22.6°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7638; ConvF(4.32, 4.32, 4.32) @ 5750 MHz; Calibrated: 3/3/2021
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1644; Calibrated: 1/11/2021
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 2027
Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7495)

5750 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 18.3 W/kg
SAR(1 g) = 3.83 W/kg; SAR(10 g) = 1.07 W/kg
Deviation(1 g) = 4.79%



0 dB = 9.57 W/kg = 9.81 dBW/kg

APPENDIX C: SAR TISSUE SPECIFICATIONS

Measurement Procedure for Tissue verification:

1) The network analyzer and probe system was configured and calibrated.
2) The probe was immersed in the tissue. The tissue was placed in a nonmetallic container. Trapped air bubbles beneath the flange were minimized by placing the probe at a slight angle.
3) The complex admittance with respect to the probe aperture was measured
4) The complex relative permittivity ε' can be calculated from the below equation (Pournaropoulos and Misra):

$$Y = \frac{j2\omega\varepsilon_r\varepsilon_0}{\left[\ln(b/a)\right]^2}\int_a^b\int_a^b\int_0^\pi \cos\phi' \frac{\exp\left[-j\omega r(\mu_0\varepsilon_r'\varepsilon_0)^{1/2}\right]}{r} d\phi' d\rho' d\rho$$

where *Y* is the admittance of the probe in contact with the sample, the primed and unprimed coordinates refer to source and observation points, respectively, $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\phi'$, ω is the angular frequency, and $j = \sqrt{-1}$.

3 Composition / Information on ingredients

3.2 Mixtures
Description: Aqueous solution with surfactants and inhibitors
Declarable, or hazardous components:

CAS: 107-21-1 EINECS: 203-473-3 Reg.nr.: 01-2119456816-28-0000	**Ethanediol** STOT RE 2, H373; Acute Tox. 4, H302	>1.0-4.9%
CAS: 68608-26-4 EINECS: 271-781-5 Reg.nr.: 01-2119527859-22-0000	**Sodium petroleum sulfonate** Eye Irrit. 2, H319	< 2.9%
CAS: 107-41-5 EINECS: 203-489-0 Reg.nr.: 01-2119539582-35-0000	**Hexylene Glycol / 2-Methyl-pentane-2,4-diol** Skin Irrit. 2, H315; Eye Irrit. 2, H319	< 2.9%
CAS: 68920-66-1 NLP: 500-236-9 Reg.nr.: 01-2119489407-26-0000	**Alkoxylated alcohol, > C_{16}** Aquatic Chronic 2, H411; Skin Irrit. 2, H315; Eye Irrit. 2, H319	< 2.0%

Additional information:
For the wording of the listed risk phrases refer to section 16.
Not mentioned CAS-, EINECS- or registration numbers are to be regarded as Proprietary/Confidential.
The specific chemical identity and/or exact percentage concentration of proprietary components is withheld as a trade secret.

Figure C-1

Note: Liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.

Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

s p e a g

Measurement Certificate / Material Test

Item Name	**Body Tissue Simulating Liquid (MBBL600-6000V6)**
Product No.	SL AAM U16 BC (Batch: 200803-1)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated DAK probe.

Target Parameters

Target parameters as defined in the KDB 865664 compliance standard.

Test Condition

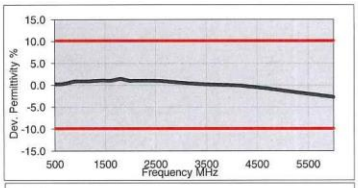
Ambient Condition	22°C ; 30% humidity
TSL Temperature	22°C
Test Date	6-Aug-20
Operator	CL

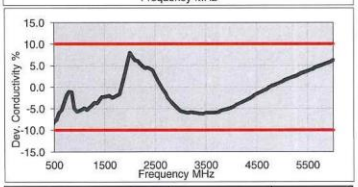
Additional Information

TSL Density
TSL Heat-capacity

Results

	Measured			Target		Diff.to Target [%]	
f [MHz]	e'	e''	sigma	eps	sigma	Δ-eps	Δ-sigma
600	56.3	26.8	0.89	56.1	0.95	0.3	-6.3
750	55.8	22.6	0.94	55.5	0.96	0.5	-2.1
800	55.7	21.6	0.96	55.3	0.97	0.7	-1.0
825	55.7	21.1	0.97	55.2	0.98	0.8	-1.0
835	55.7	20.9	0.98	55.1	0.99	1.0	-0.5
850	55.6	20.7	0.98	55.2	0.99	0.8	-1.0
900	55.5	19.9	1.00	55.0	1.05	0.9	-4.8
1400	54.7	15.9	1.24	54.1	1.28	1.1	-3.1
1450	54.6	15.8	1.27	54.0	1.30	1.1	-2.3
1600	54.4	15.3	1.36	53.8	1.39	1.1	-2.2
1625	54.4	15.3	1.38	53.8	1.41	1.2	-2.1
1640	54.4	15.2	1.39	53.7	1.42	1.3	-2.1
1650	54.3	15.2	1.39	53.7	1.43	1.1	-2.8
1700	54.2	15.1	1.43	53.6	1.46	1.2	-2.1
1750	54.2	15.0	1.46	53.4	1.49	1.4	-2.0
1800	54.1	14.9	1.50	53.3	1.52	1.5	-1.3
1810	54.1	14.9	1.51	53.3	1.52	1.5	-0.7
1825	54.1	14.9	1.52	53.3	1.52	1.5	0.0
1850	54.0	14.9	1.53	53.3	1.52	1.3	0.7
1900	54.0	14.8	1.57	53.3	1.52	1.3	3.3
1950	53.9	14.8	1.60	53.3	1.52	1.1	5.3
2000	53.8	14.8	1.64	53.3	1.52	0.9	7.9
2050	53.8	14.7	1.68	53.2	1.57	1.1	7.0
2100	53.7	14.7	1.72	53.2	1.62	1.0	6.2
2150	53.7	14.7	1.76	53.1	1.66	1.1	6.0
2200	53.6	14.7	1.80	53.0	1.71	1.1	5.3
2250	53.5	14.8	1.85	53.0	1.76	1.0	5.1
2300	53.5	14.8	1.89	52.9	1.81	1.1	4.4
2350	53.4	14.8	1.94	52.8	1.85	1.1	4.9
2400	53.3	14.8	1.98	52.8	1.90	1.0	4.2
2450	53.3	14.9	2.03	52.7	1.95	1.1	4.1
2500	53.2	14.9	2.07	52.6	2.02	1.1	2.5
2550	53.1	15.0	2.12	52.6	2.09	1.0	1.4
2600	53.0	15.0	2.17	52.5	2.16	0.9	0.5





3500	51.4	16.0	3.11	51.3	3.31	0.2	-6.0
3700	51.1	16.2	3.34	51.1	3.55	0.1	-5.9
5200	48.3	18.7	5.42	49.0	5.30	-1.5	2.3
5250	48.2	18.8	5.50	49.0	5.36	-1.6	2.5
5300	48.1	18.9	5.57	48.9	5.42	-1.7	2.8
5500	47.7	19.2	5.86	48.6	5.65	-2.0	3.8
5600	47.5	19.3	6.01	48.5	5.77	-2.1	4.2
5700	47.3	19.4	6.16	48.3	5.88	-2.3	4.8
5800	47.0	19.6	6.32	48.2	6.00	-2.4	5.3
6000	46.6	19.8	6.62	47.9	6.23	-2.7	6.3
6500							
7000							
7500							
8000							
8500							
9000							
9500							
10000							

Figure C-2
600 – 5800 MHz Body Tissue Equivalent Matter

APPENDIX D: SAR SYSTEM VALIDATION

Per FCC KDB Publication 865664 D02v01r02, SAR system validation status should be documented to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles were used with the required tissue- equivalent media for system validation, according to the procedures outlined in FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point was validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

A tabulated summary of the system validation status including the validation date(s), measurement frequencies, SAR probes and tissue dielectric parameters has been included.

Table D-1
SAR System Validation Summary – 1g

SAR SYSTEM #	FREQ. [MHz]	DATE	PROBE SN	PROBE CAL. POINT		COND.	PERM.	CW VALIDATION			MOD. VALIDATION		
						(σ)	(εr)	SENSITIVITY	PROBE LINEARITY	PROBE ISOTROPY	MOD. TYPE	DUTY FACTOR	PAR
AM2	2450	5/17/2021	7532	2450	Body	2.031	51.888	PASS	PASS	PASS	OFDM/TDD	PASS	PASS
AM9	5250	5/12/2021	7638	5250	Body	5.412	47.566	PASS	PASS	PASS	OFDM	N/A	PASS
AM9	5600	5/12/2021	7638	5600	Body	5.925	46.935	PASS	PASS	PASS	OFDM	N/A	PASS
AM9	5750	5/12/2021	7638	5750	Body	6.129	46.6	PASS	PASS	PASS	OFDM	N/A	PASS

NOTE: While the probes have been calibrated for both CW and modulated signals, all measurements were performed using communication systems calibrated for CW signals only. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664 D01v01r04 for scenarios when CW probe calibrations are used with other signal types. SAR systems were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5 dB), such as OFDM according to FCC KDB Publication 865664 D01v01r04.