ELEMENT MATERIALS TECHNOLOGY
(formerly PCTEST)
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. +1.410.290.6652 / Fax +1.410.290.6654
http://www.element.com

RF Exposure Part 1 Test Report

Applicant Name:
Microsoft Corporation
One Microsoft Way
Redmond, WA 98052 USA

Date of Testing:
01/13/2025 – 01/22/2025
Test Site/Location:
Element, Columbia, MD, USA
Document Serial No.:
1M2503050024-01.C3K (Rev2)

FCC ID: **C3K00002101**

APPLICANT: **MICROSOFT CORPORATION**

DUT Type:	Wireless Module
Application Type:	Class II Permissive Change
FCC Rule Part(s):	CFR §2.1093
Model(s):	HWB-Q93
Host Model Name	2110
Host Model FCC ID:	C3K2110
Permissive Change(s):	FCC C2PC Cover Letter for 2109 and 2110

Equipment Class	Band & Mode	Tx Frequency	SAR (W/kg)	
			Power Mode 1	Power Mode 2
DTS	2.4 GHz WIFI	2412 - 2472 MHz	**<0.1**	**0.92**
NII	5 GHz WIFI	U-NII-1: 5180 - 5240 MHz U-NII-2A: 5260 - 5320 MHz U-NII-2C: 5500 - 5720 MHz U-NII-3: 5745 - 5825 MHz U-NII-4: 5845 - 5885 MHz	**<0.1**	**1.08**
6CD	6 GHz WIFI	U-NII-5: 5945 - 6415 MHz U-NII-6: 6435 - 6515 MHz U-NII-7: 6535 - 6875 MHz U-NII-8: 6895 - 7115 MHz	**<0.1**	**0.96**
DSS	2.4 GHz Bluetooth	2402 - 2480 MHz	**<0.1**	**0.88**
Simultaneous SAR per KDB 690783 D01v01r03:			<0.1	**1.54**

Equipment Class	Band & Mode	Tx Frequency	APD (W/m^2)		Reported PD (W/m^2)
			Power Mode 1	Power Mode 2	
6CD	6 GHz WIFI	U-NII-5: 5935 - 6415 MHz U-NII-6: 6435 - 6515 MHz U-NII-7: 6535 - 6875 MHz U-NII-8: 6895 - 7115 MHz	**<0.1**	**6.10**	7.464

Note: 1. This table above includes test data from RF exposure technical report S/N: 1M2503050023-01.C3K per FCC TCB workshop for data referencing of closely related product APPENDIX G (Module FCC ID C3K00002101 integrated into Host FCC ID C3K2109). 2. 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.

Only operations relevant to this permissive change were evaluated for compliance. The FCC C2PC Cover Letter for 2109 and 2110 includes a description of all changed items. Please see the compliance evaluation for the host model in RF Exposure Technical Report S/N 1M2412090111-01.C3K for complete evaluation of all other operating modes.

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 1.9 of this report; for North American frequency bands only.

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

RJ Ortanez
Executive Vice President

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

TABLE OF CONTENTS

1 TEST LABORATORY INFORMATION

1.1 Introduction

This test report for device subject to testing at an accredited testing laboratory has been generated by the testing laboratory that tested the device. Detailed location and accredited information regarding the testing laboratories are provided below.

1.2 Test Laboratories Information

1.2.1 Testing Laboratory 1

Test Firm Name	ELEMENT MATERIALS TECHNOLOGY WASHINGTON DC LLC
Test Lab Location	7185 Oakland Mills Road, Columbia, MD 21046, United States Tel. +1.410.290.6652 / Fax +1.410.290.6654
Accreditation Info.	Lab Code. (ISED): 2451B
	CAB Identifier (NIST): US0110
	ISO/IEC 17025 (A2LA): CERT #2041.01
	ilac-MRA A2LA ACCREDITED CERT #2041.01
Measurement System No.	J, R, S, Q

2 DEVICE UNDER TEST

2.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
2.4 GHz WIFI	Data	2412 - 2472 MHz
5 GHz WIFI	Data	U-NII-1: 5180 - 5240 MHz U-NII-2A: 5260 - 5320 MHz U-NII-2C: 5500 - 5720 MHz U-NII-3: 5745 - 5825 MHz U-NII-4: 5845 - 5885 MHz
6 GHz WIFI	Data	U-NII-5: 5935 - 6415 MHz U-NII-6: 6435 - 6515 MHz U-NII-7: 6535 - 6875 MHz U-NII-8: 6895 - 7115 MHz
2.4 GHz Bluetooth	Data	2402 - 2480 MHz

2.2 Data Referencing

Reference Device		**Variant Device**	**Key Differences**
Module FCC ID: C3K00002101 C2PC Integrated into host FCC ID: C3K2109		FCC ID: C3K00002101 C2PC Integrated into host FCC ID: C3K2110	Removed components for NFC Reader (see KDB Inquiry 240179 exhibit for Data Referencing)
Equipment Class	Mode	Data Referencing	Comments
DTS	2.4 GHz WIFI	Y	See Section 10 for spot-check data
NII	5 GHz WIFI	Y	See Section 10 for spot-check data
6CD	6 GHz WIFI	Y	See Section 10 for spot-check data
DSS	2.4 GHz BT	Y	See Section 10 for spot-check data

Per manufacturer declaration, there are two devices with Module FCC ID: C3K00002101 C2PC (integrated into host FCC ID: C3K2109) reference model and FCC ID: C3K00002101 C2PC (integrated into host FCC ID: C3K2110) variant model, with high degree of similarity. Both models share the same material, form factor, circuit design, and components, including antennas and their locations. The reference and variant models use the same material, form factor, circuit design, and components, including antennas and their locations. The reference and variant models use the same power tables and have same tune-up tolerances.

Per FCC Approved Data Referencing Test Plan, testing was done fully on the reference model, while spot-check verification has been performed on variant model. The reference and variant model comparison data summary is included in section 10. Please see RF exposure technical reports in Appendix H for complete compliance evaluation for the reference model.

2.3 Time-Averaging Algorithm for RF Exposure Compliance

This Device is enabled with the Qualcomm® FastConnect TAS feature for WLAN technologies. This feature performs time averaging algorithm in real time to control and manage transmitting power and ensure the timeaveraged RF exposure is in compliance with FCC requirements all the time. Refer to Compliance Summary document for detailed description of Qualcomm® FastConnect TAS feature (report SN could be found in Section 2.11 – Bibliography).

Note that Bluetooth operations are not enabled with TAS.

The FastConnect TAS algorithm maintains the time-averaged transmit power, in turn, time-averaged RF exposure of SAR_design_target, below the predefined time-averaged power limit (i.e., *Plimit* for WLAN), for each characterized technology and band (see RF Exposure Part 0 Test Report of the reference report, report SN found in Section 2.11 - Bibliography).

FastConnect TAS allows the device to transmit at higher power instantaneously, as high as *Pmax*, when needed, but enforces power limiting to maintain time-averaged transmit power to *Plimit*. Below table shows Final *Plimit* settings and maximum tune up output power *Pmax* configured for this DUT for various transmit conditions (Device State Index DSI for FastConnect.)

This device operates using two different DSIs, each corresponding to a different power level. Throughout this report, DSI=0 (Laptop and/or No Motion) will be defined as Power mode 1 (high power test cases) and DSI=1 (Tablet and Motion) will be defined as Power mode 2 (low power test cases).

Exposure Scenario			Maximum Tune-Up Output Power*	Power Mode 1	Power Mode 2
Averaging Volume				1g	1g
Spacing				25mm, 0mm	0mm
DSI				0	1
Technology/Band	Antenna	Antenna Group	P_{max}	P_{limit}	P_{limit}
2.4 GHz WIFI	R	AG0	22.0	34.3	16.25
2.4 GHz WIFI	L	AG1	22.0	33.7	16.25
5 GHz WIFI	R	AG0	20.5	29.8	16.0
5 GHz WIFI	L	AG1	20.5	27.4	16.0
6 GHz WIFI	R	AG0	18.0	30.3	14.0
6 GHz WIFI	L	AG1	18.0	29.3	14.0

Notes:
-All Plimit and maximum tune up output power Pmax levels entered in above Table correspond to average power levels after accounting for duty cycle in the case of OFDM modulation schemes (e.g. WLAN).

Per Qualcomm guidance, MIMO plimits are not included when the WLAN antennas are in separate antenna groups.

The purpose of this report (Part 1 test) is to demonstrate that the EUT meets FCC SAR limits when transmitting in static transmission scenario at maximum allowable time-averaged power levels.

2.4 Power Reduction for SAR

This device used an independent fixed level power reduction mechanism for Bluetooth when the device is used in Power Mode configurations defined below. Detailed descriptions of the power reduction mechanism are included in the operational description.

This device operates using three different Power Modes for Bluetooth. Throughout this report, Power Mode A will refer to the Bluetooth output power in Laptop Mode or Tablet Mode with no motion detected (high power test cases), Power Mode B will refer to the Bluetooth output power in Tablet Mode with WLAN inactive, and Power Mode C will refer to the Bluetooth output power in Tablet Mode with WLAN active.

2.5 Nominal and Maximum Output Power Specifications

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

Note: Targets for 802.11ax/be RU operations can be found in 802.11ax/be RU SAR Exclusion Appendix of the reference report.

2.5.1 2.4 GHz WLAN Output Power

The below table is applicable in the following conditions:

- Pmax, DSI=0 (Power Mode 1)

IEEE 802.11 Modulated Output Power (in dBm) — SISO/SISO in MIMO, Antenna R

Mode	Bandwidth	b		g		n		ac		ax (SU)		be (SU)	
Maximum / Nominal Power		Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.
2.4 GHz WLAN	20MHz	23.0 ch. 12: 16.5 ch. 13: 9.0	22.0 15.5 8.0	20.5 ch. 1: 16.0 ch. 2: 18.0 ch. 3: 19.0 ch. 11: 15.5 ch. 12: 13.0 ch. 13: -7.0	19.5 15.0 17.0 18.0 14.5 12.0 -8.5	19.5 ch. 1: 16.5 ch. 11: 14.5 ch. 12: 12.5 ch. 13: -8.5	18.5 15.5 13.5 11.5 -10.0	19.5 ch. 1: 16.5 ch. 11: 14.5 ch. 12: 12.5 ch. 13: -8.5	18.5 15.5 13.5 11.5 -10.0	19.5 ch. 1: 16.5 ch. 11: 14.5 ch. 12: 12.5 ch. 13: -8.5	18.5 15.5 13.5 11.5 -10.0	19.5 ch. 1: 16.5 ch. 11: 14.5 ch. 12: 12.5 ch. 13: -8.5	18.5 15.5 13.5 11.5 -10.0
Mode	Bandwidth	[redacted]				n		ac		ax (SU)		be (SU)	
Maximum / Nominal Power						Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.
2.4 GHz WLAN	40 MHz					18.5 ch. 3: 14.0 ch. 4: 16.0 ch. 5: 16.0 ch. 7: 17.5 ch. 8: 17.5 ch. 9: 14.0 ch. 10: 9.5 ch. 11: -8.0	17.5 13.0 15.0 15.0 16.5 16.5 13.0 8.5 -9.5	18.5 ch. 3: 14.0 ch. 4: 16.0 ch. 5: 16.0 ch. 7: 17.5 ch. 8: 17.5 ch. 9: 14.0 ch. 10: 9.5 ch. 11: -8.0	17.5 13.0 15.0 15.0 16.5 16.5 13.0 8.5 -9.5	18.5 ch. 3: 14.0 ch. 4: 16.0 ch. 5: 16.0 ch. 7: 17.5 ch. 8: 17.5 ch. 9: 14.0 ch. 10: 9.5 ch. 11: -8.0	17.5 13.0 15.0 15.0 16.5 16.5 13.0 8.5 -9.5	18.5 ch. 3: 14.0 ch. 4: 16.0 ch. 5: 16.0 ch. 7: 17.5 ch. 8: 17.5 ch. 9: 14.0 ch. 10: 9.5 ch. 11: -8.0	17.5 13.0 15.0 15.0 16.5 16.5 13.0 8.5 -9.5

IEEE 802.11 Modulated Output Power (in dBm) — SISO/SISO in MIMO, Antenna L

Mode	Bandwidth	b		g		n		ac		ax (SU)		be (SU)	
Maximum / Nominal Power		Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.
2.4 GHz WLAN	20MHz	23.0 ch. 12: 16.5 ch. 13: 9.0	22.0 15.5 8.0	20.5 ch. 1: 16.0 ch. 2: 18.0 ch. 3: 19.0 ch. 11: 15.5 ch. 12: 13.0 ch. 13: -7.0	19.5 15.0 17.0 18.0 14.5 12.0 -8.5	19.5 ch. 1: 16.5 ch. 11: 14.5 ch. 12: 12.5 ch. 13: -8.5	18.5 15.5 13.5 11.5 -10.0	19.5 ch. 1: 16.5 ch. 11: 14.5 ch. 12: 12.5 ch. 13: -8.5	18.5 15.5 13.5 11.5 -10.0	19.5 ch. 1: 16.5 ch. 11: 14.5 ch. 12: 12.5 ch. 13: -8.5	18.5 15.5 13.5 11.5 -10.0	19.5 ch. 1: 16.5 ch. 11: 14.5 ch. 12: 12.5 ch. 13: -8.5	18.5 15.5 13.5 11.5 -10.0
Mode	Bandwidth	[redacted]				n		ac		ax (SU)		be (SU)	
Maximum / Nominal Power						Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.
2.4 GHz WLAN	40 MHz					18.5 ch. 3: 14.0 ch. 4: 16.0 ch. 5: 16.0 ch. 7: 17.5 ch. 8: 17.5 ch. 9: 14.0 ch. 10: 9.5 ch. 11: -8.0	17.5 13.0 15.0 15.0 16.5 16.5 13.0 8.5 -9.5	18.5 ch. 3: 14.0 ch. 4: 16.0 ch. 5: 16.0 ch. 7: 17.5 ch. 8: 17.5 ch. 9: 14.0 ch. 10: 9.5 ch. 11: -8.0	17.5 13.0 15.0 15.0 16.5 16.5 13.0 8.5 -9.5	18.5 ch. 3: 14.0 ch. 4: 16.0 ch. 5: 16.0 ch. 7: 17.5 ch. 8: 17.5 ch. 9: 14.0 ch. 10: 9.5 ch. 11: -8.0	17.5 13.0 15.0 15.0 16.5 16.5 13.0 8.5 -9.5	18.5 ch. 3: 14.0 ch. 4: 16.0 ch. 5: 16.0 ch. 7: 17.5 ch. 8: 17.5 ch. 9: 14.0 ch. 10: 9.5 ch. 11: -8.0	17.5 13.0 15.0 15.0 16.5 16.5 13.0 8.5 -9.5

The below table is applicable in the following conditions:

- DSI=1 (Power Mode 2)

IEEE 802.11 Modulated Output Power (in dBm) — SISO/SISO in MIMO, Antenna R

Mode	Bandwidth	b		g		n		ac		ax (SU)		be (SU)	
Maximum / Nominal Power		Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.
2.4 GHz WLAN	20MHz	17.25 ch. 12: 16.5 ch. 13: 9.0	16.25 15.5 8.0	17.25 ch. 1: 16.0 ch. 11: 15.5 ch. 12: 13.0 ch. 13: -7.0	16.25 15.0 14.5 12.0 -8.5	17.25 ch. 1: 16.5 ch. 11: 14.5 ch. 12: 12.5 ch. 13: -8.5	16.25 15.5 13.5 11.5 -10.0	17.25 ch. 1: 16.5 ch. 11: 14.5 ch. 12: 12.5 ch. 13: -8.5	16.25 15.5 13.5 11.5 -10.0	17.25 ch. 1: 16.5 ch. 11: 14.5 ch. 12: 12.5 ch. 13: -8.5	16.25 15.5 13.5 11.5 -10.0	17.25 ch. 1: 16.5 ch. 11: 14.5 ch. 12: 12.5 ch. 13: -8.5	16.25 15.5 13.5 11.5 -10.0
Mode	Bandwidth	[redacted]				n		ac		ax (SU)		be (SU)	
Maximum / Nominal Power						Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.
2.4 GHz WLAN	40 MHz					17.25 ch. 3: 14.0 ch. 4: 16.0 ch. 5: 16.0 ch. 9: 14.0 ch. 10: 9.5 ch. 11: -8.0	16.25 13.0 15.0 15.0 13.0 8.5 -9.5	17.25 ch. 3: 14.0 ch. 4: 16.0 ch. 5: 16.0 ch. 9: 14.0 ch. 10: 9.5 ch. 11: -8.0	16.25 13.0 15.0 15.0 13.0 8.5 -9.5	17.25 ch. 3: 14.0 ch. 4: 16.0 ch. 5: 16.0 ch. 9: 14.0 ch. 10: 9.5 ch. 11: -8.0	16.25 13.0 15.0 15.0 13.0 8.5 -9.5	17.25 ch. 3: 14.0 ch. 4: 16.0 ch. 5: 16.0 ch. 9: 14.0 ch. 10: 9.5 ch. 11: -8.0	16.25 13.0 15.0 15.0 13.0 8.5 -9.5

IEEE 802.11 Modulated Output Power (in dBm) — SISO/SISO in MIMO, Antenna L

Mode	Bandwidth	b		g		n		ac		ax (SU)		be (SU)	
Maximum / Nominal Power		Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.
2.4 GHz WLAN	20MHz	17.25 ch. 12: 16.5 ch. 13: 9.0	16.25 15.5 8.0	17.25 ch. 1: 16.0 ch. 11: 15.5 ch. 12: 13.0 ch. 13: -7.0	16.25 15.0 14.5 12.0 -8.5	17.25 ch. 1: 16.5 ch. 11: 14.5 ch. 12: 12.5 ch. 13: -8.5	16.25 15.5 13.5 11.5 -10.0	17.25 ch. 1: 16.5 ch. 11: 14.5 ch. 12: 12.5 ch. 13: -8.5	16.25 15.5 13.5 11.5 -10.0	17.25 ch. 1: 16.5 ch. 11: 14.5 ch. 12: 12.5 ch. 13: -8.5	16.25 15.5 13.5 11.5 -10.0	17.25 ch. 1: 16.5 ch. 11: 14.5 ch. 12: 12.5 ch. 13: -8.5	16.25 15.5 13.5 11.5 -10.0
Mode	Bandwidth	[redacted]				n		ac		ax (SU)		be (SU)	
Maximum / Nominal Power						Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.
2.4 GHz WLAN	40 MHz					17.25 ch. 3: 14.0 ch. 4: 16.0 ch. 5: 16.0 ch. 9: 14.0 ch. 10: 9.5 ch. 11: -8.0	16.25 13.0 15.0 15.0 13.0 8.5 -9.5	17.25 ch. 3: 14.0 ch. 4: 16.0 ch. 5: 16.0 ch. 9: 14.0 ch. 10: 9.5 ch. 11: -8.0	16.25 13.0 15.0 15.0 13.0 8.5 -9.5	17.25 ch. 3: 14.0 ch. 4: 16.0 ch. 5: 16.0 ch. 9: 14.0 ch. 10: 9.5 ch. 11: -8.0	16.25 13.0 15.0 15.0 13.0 8.5 -9.5	17.25 ch. 3: 14.0 ch. 4: 16.0 ch. 5: 16.0 ch. 9: 14.0 ch. 10: 9.5 ch. 11: -8.0	16.25 13.0 15.0 15.0 13.0 8.5 -9.5

2.5.2 5 GHz WLAN Output Power

The below table is applicable in the following conditions:

- Pmax, DSI=0 (Power Mode 1)

Mode	Band	IEEE 802.11 Modulated Output Power (in dBm)																			
		SISO/SISO in MIMO										SISO/SISO in MIMO									
		Antenna R										Antenna L									
		a		n		ac		ax (SU)		be (SU)		a		n		ac		ax (SU)		be (SU)	
Maximum / Nominal Power		Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.
5 GHz WIFI (20MHz BW)	UNII-1	17.0 ch. 36: 16.5	16.0 15.5	17.5 ch. 36: 16.0	16.5 15.0	17.5 ch. 36: 16.0	16.5 15.0	17.5 ch. 36: 16.0	16.5 15.0	17.5 ch. 36: 16.0	16.5 15.0	17.0 ch. 36: 16.5	16.0 15.5	17.5 ch. 36: 16.0	16.5 15.0	17.5 ch. 36: 16.0	16.5 15.0	17.5 ch. 36: 16.0	16.5 15.0	17.5 ch. 36: 16.0	16.5 15.0
	UNII-2A	17.5 ch. 64: 17.0	16.5 16.0	17.5 ch. 64: 16.5	16.5 15.5	17.5 ch. 64: 16.5	16.5 15.5	17.5 ch. 64: 16.5	16.5 15.5	17.5 ch. 64: 16.5	16.5 15.5	17.5 ch. 64: 17.0	16.5 16.0	17.5 ch. 64: 16.5	16.5 15.5	17.5 ch. 64: 16.5	16.5 15.5	17.5 ch. 64: 16.5	16.5 15.5	17.5 ch. 64: 16.5	16.5 15.5
	UNII-2C	17.5 ch. 140: 17.0	16.5 16.0	17.5 ch. 140: 16.5	16.5 15.5	17.5 ch. 140: 16.5	16.5 15.5	17.5 ch. 140: 16.5	16.5 15.5	17.5 ch. 140: 16.5	16.5 15.5	17.5 ch. 140: 17.0	16.5 16.0	17.5 ch. 140: 16.5	16.5 15.5	17.5 ch. 140: 16.5	16.5 15.5	17.5 ch. 140: 16.5	16.5 15.5	17.5 ch. 140: 16.5	16.5 15.5
	UNII-3	21.5 ch. 149: 16.0	20.5 15.0	21.5 ch. 149: 16.0	20.5 15.0	21.5 ch. 149: 16.0	20.5 15.0	21.5 ch. 149: 16.0	20.5 15.0	21.5 ch. 149: 16.0	20.5 15.0	21.5 ch. 149: 16.0	20.5 15.0	21.5 ch. 149: 16.0	20.5 15.0	21.5 ch. 149: 16.0	20.5 15.0	21.5 ch. 149: 16.0	20.5 15.0	21.5 ch. 149: 16.0	20.5 15.0
	UNII-4	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5
5 GHz WIFI (40MHz BW)	UNII-1			17.5 ch. 38: 15.0	16.5 14.0	17.5 ch. 38: 15.0	16.5 14.0	17.5 ch. 38: 15.0	16.5 14.0	17.5 ch. 38: 15.0	16.5 14.0			17.5 ch. 38: 15.0	16.5 14.0	17.5 ch. 38: 15.0	16.5 14.0	17.5 ch. 38: 15.0	16.5 14.0	17.5 ch. 38: 15.0	16.5 14.0
	UNII-2A			18.0 ch. 62: 14.5	17.0 13.5	18.0 ch. 62: 14.5	17.0 13.5	18.0 ch. 62: 14.5	17.0 13.5	18.0 ch. 62: 14.5	17.0 13.5			18.0 ch. 62: 14.5	17.0 13.5	18.0 ch. 62: 14.5	17.0 13.5	18.0 ch. 62: 14.5	17.0 13.5	18.0 ch. 62: 14.5	17.0 13.5
	UNII-2C			18.5 ch. 102: 16.0 ch. 134: 18.0 ch. 142: 16.0	17.5 15.0 17.0 15.0	18.5 ch. 102: 16.0 ch. 134: 18.0 ch. 142: 16.0	17.5 15.0 17.0 15.0	18.5 ch. 102: 16.0 ch. 134: 18.0 ch. 142: 16.0	17.5 15.0 17.0 15.0	18.5 ch. 102: 16.0 ch. 134: 18.0 ch. 142: 16.0	17.5 15.0 17.0 15.0			18.5 ch. 102: 16.0 ch. 134: 18.0 ch. 142: 16.0	17.5 15.0 17.0 15.0	18.5 ch. 102: 16.0 ch. 134: 18.0 ch. 142: 16.0	17.5 15.0 17.0 15.0	18.5 ch. 102: 16.0 ch. 134: 18.0 ch. 142: 16.0	17.5 15.0 17.0 15.0	18.5 ch. 102: 16.0 ch. 134: 18.0 ch. 142: 16.0	17.5 15.0 17.0 15.0
	UNII-3			19.0	18.0	19.0	18.0	19.0	18.0	19.0	18.0			19.0	18.0	19.0	18.0	19.0	18.0	19.0	18.0
	UNII-4			19.0	18.0	19.0	18.0	19.0	18.0	19.0	18.0			19.0	18.0	19.0	18.0	19.0	18.0	19.0	18.0
5 GHz WIFI (80MHz BW)	UNII-1					14.0	13.0	14.0	13.0	14.0	13.0					14.0	13.0	14.0	13.0	14.0	13.0
	UNII-2A					15.0	14.0	15.0	14.0	15.0	14.0					15.0	14.0	15.0	14.0	15.0	14.0
	UNII-2C					19.0 ch. 106: 15.5 ch. 122: 18.0	18.0 14.5 17.0	19.0 ch. 106: 15.5 ch. 122: 18.0	18.0 14.5 17.0	19.0 ch. 106: 15.5 ch. 122: 18.0	18.0 14.5 17.0					19.0 ch. 106: 15.5 ch. 122: 18.0	18.0 14.5 17.0	19.0 ch. 106: 15.5 ch. 122: 18.0	18.0 14.5 17.0	19.0 ch. 106: 15.5 ch. 122: 18.0	18.0 14.5 17.0
	UNII-3					19.0	18.0	19.0	18.0	19.0	18.0					19.0	18.0	19.0	18.0	19.0	18.0
	UNII-4					19.0	18.0	19.0	18.0	19.0	18.0					19.0	18.0	19.0	18.0	19.0	18.0
5 GHz WIFI (160MHz BW)	UNII-1/2A					12.0	11.0	12.0	11.0	12.0	11.0					12.0	11.0	12.0	11.0	12.0	11.0
	UNII-2C					11.0	10.0	11.0	10.0	11.0	10.0					11.0	10.0	11.0	10.0	11.0	10.0
	UNII-3/4					13.0	12.0	13.0	12.0	13.0	12.0					13.0	12.0	13.0	12.0	13.0	12.0

The below table is applicable in the following conditions:

- DSI=1 (Power Mode 2)

Mode	Band	IEEE 802.11 Modulated Output Power (in dBm)																			
		SISO/SISO in MIMO										SISO/SISO in MIMO									
		Antenna R										Antenna L									
		a		n		ac		ax (SU)		be (SU)		a		n		ac		ax (SU)		be (SU)	
Maximum / Nominal Power		Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.
5 GHz WIFI (20MHz BW)	UNII-1	16.25	15.25	16.25 ch. 36: 16.0	15.25 15.0	16.25 ch. 36: 16.0	15.25 15.0	16.25 ch. 36: 16.0	15.25 15.0	16.25 ch. 36: 16.0	15.25 15.0	16.25	15.25	16.25 ch. 36: 16.0	15.25 15.0	16.25 ch. 36: 16.0	15.25 15.0	16.25 ch. 36: 16.0	15.25 15.0	16.25 ch. 36: 16.0	15.25 15.0
	UNII-2A	16.5	15.5	16.5	15.5	16.5	15.5	16.5	15.5	16.5	15.5	16.5	15.5	16.5	15.5	16.5	15.5	16.5	15.5	16.5	15.5
	UNII-2C	16.5	15.5	16.5	15.5	16.5	15.5	16.5	15.5	16.5	15.5	16.5	15.5	16.5	15.5	16.5	15.5	16.5	15.5	16.5	15.5
	UNII-3	16.75 ch. 149: 16.0	15.75 15.0	16.75 ch. 149: 16.0	15.75 15.0	16.75 ch. 149: 16.0	15.75 15.0	16.75 ch. 149: 16.0	15.75 15.0	16.75 ch. 149: 16.0	15.75 15.0	16.75 ch. 149: 16.0	15.75 15.0	16.75 ch. 149: 16.0	15.75 15.0	16.75 ch. 149: 16.0	15.75 15.0	16.75 ch. 149: 16.0	15.75 15.0	16.75 ch. 149: 16.0	15.75 15.0
	UNII-4	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5	16.0 ch. 173: 15.5 ch. 177: 15.5	15.0 14.5 14.5
5 GHz WIFI (40MHz BW)	UNII-1			16.25 ch. 38: 15.0	15.25 14.0	16.25 ch. 38: 15.0	15.25 14.0	16.25 ch. 38: 15.0	15.25 14.0	16.25 ch. 38: 15.0	15.25 14.0			16.25 ch. 38: 15.0	15.25 14.0	16.25 ch. 38: 15.0	15.25 14.0	16.25 ch. 38: 15.0	15.25 14.0	16.25 ch. 38: 15.0	15.25 14.0
	UNII-2A			16.5 ch. 62: 14.5	15.5 13.5	16.5 ch. 62: 14.5	15.5 13.5	16.5 ch. 62: 14.5	15.5 13.5	16.5 ch. 62: 14.5	15.5 13.5			16.5 ch. 62: 14.5	15.5 13.5	16.5 ch. 62: 14.5	15.5 13.5	16.5 ch. 62: 14.5	15.5 13.5	16.5 ch. 62: 14.5	15.5 13.5
	UNII-2C			16.5 ch. 102: 16.0 ch. 142: 16.0	15.5 15.0 15.0	16.5 ch. 102: 16.0 ch. 142: 16.0	15.5 15.0 15.0	16.5 ch. 102: 16.0 ch. 142: 16.0	15.5 15.0 15.0	16.5 ch. 102: 16.0 ch. 142: 16.0	15.5 15.0 15.0			16.5 ch. 102: 16.0 ch. 142: 16.0	15.5 15.0 15.0	16.5 ch. 102: 16.0 ch. 142: 16.0	15.5 15.0 15.0	16.5 ch. 102: 16.0 ch. 142: 16.0	15.5 15.0 15.0	16.5 ch. 102: 16.0 ch. 142: 16.0	15.5 15.0 15.0
	UNII-3			16.75	15.75	16.75	15.75	16.75	15.75	16.75	15.75			16.75	15.75	16.75	15.75	16.75	15.75	16.75	15.75
	UNII-4			17.0	16.0	17.0	16.0	17.0	16.0	17.0	16.0			17.0	16.0	17.0	16.0	17.0	16.0	17.0	16.0
5 GHz WIFI (80MHz BW)	UNII-1					14.0	13.0	14.0	13.0	14.0	13.0					14.0	13.0	14.0	13.0	14.0	13.0
	UNII-2A					15.0	14.0	15.0	14.0	15.0	14.0					15.0	14.0	15.0	14.0	15.0	14.0
	UNII-2C					16.5 ch. 106: 15.5	15.5 14.5	16.5 ch. 106: 15.5	15.5 14.5	16.5 ch. 106: 15.5	15.5 14.5					16.5 ch. 106: 15.5	15.5 14.5	16.5 ch. 106: 15.5	15.5 14.5	16.5 ch. 106: 15.5	15.5 14.5
	UNII-3					16.75	15.75	16.75	15.75	16.75	15.75					16.75	15.75	16.75	15.75	16.75	15.75
	UNII-4					17.0	16.0	17.0	16.0	17.0	16.0					17.0	16.0	17.0	16.0	17.0	16.0
5 GHz WIFI (160MHz BW)	UNII-1/2A					12.0	11.0	12.0	11.0	12.0	11.0					12.0	11.0	12.0	11.0	12.0	11.0
	UNII-2C					11.0	10.0	11.0	10.0	11.0	10.0					11.0	10.0	11.0	10.0	11.0	10.0
	UNII-3/4					13.0	12.0	13.0	12.0	13.0	12.0					13.0	12.0	13.0	12.0	13.0	12.0

2.5.3 6 GHz WLAN Output Power

The below table is applicable in the following conditions:

- Pmax, DSI=0 (Power Mode 1)

Mode	Band	IEEE 802.11 Modulated Output Power (in dBm)											
		SISO/SISO in MIMO Antenna R						SISO/SISO in MIMO Antenna L					
		a		ax (SU)		be (SU)		a		ax (SU)		be (SU)	
Maximum / Nominal Power		Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.
6 GHz WIFI (20MHz BW) - SP	UNII-5	17.5	16.5	17.5	16.5	17.5	16.5	17.5	16.5	17.5	16.5	17.5	16.5
	UNII-7	17.5 ch. 181: 14.5	16.5 13.5	17.5 ch. 181: 14.5	16.5 13.5	17.5 ch. 181: 14.5	16.5 13.5	17.5 ch. 181: 14.5	16.5 13.5	17.5 ch. 181: 14.5	16.5 13.5	17.5 ch. 181: 14.5	16.5 13.5
6 GHz WIFI (40MHz BW) - SP	UNII-5			18.0	17.0	18.0	17.0			18.0	17.0	18.0	17.0
	UNII-7			18.0	17.0	18.0	17.0			18.0	17.0	18.0	17.0
6 GHz WIFI (80MHz BW) - SP	UNII-5			18.0 ch. 7: 17.0 ch. 23: 17.0	17.0 16.0 16.0	18.0 ch. 7: 17.0 ch. 23: 17.0	17.0 16.0 16.0			18.0 ch. 7: 17.0 ch. 23: 17.0	17.0 16.0 16.0	18.0 ch. 7: 17.0 ch. 23: 17.0	17.0 16.0 16.0
	UNII-7			19.0 ch. 135: 17.5	18.0 16.5	19.0 ch. 135: 17.5	18.0 16.5			19.0 ch. 135: 17.5	18.0 16.5	19.0 ch. 135: 17.5	18.0 16.5
6 GHz WIFI (160MHz BW) - SP	UNII-5			19.0 ch. 15: 16.5 ch. 47: 16.5	18.0 15.5 15.5	19.0 ch. 15: 16.5 ch. 47: 16.5	18.0 15.5 15.5			19.0 ch. 15: 16.5 ch. 47: 16.5	18.0 15.5 15.5	19.0 ch. 15: 16.5 ch. 47: 16.5	18.0 15.5 15.5
	UNII-7			19.0	18.0	19.0	18.0			19.0	18.0	19.0	18.0
6 GHz WIFI (320MHz BW) - SP	UNII-5					19.0	18.0					19.0	18.0

The below table is applicable in the following conditions:

- DSI=1 (Power Mode 2)

Mode	Band	IEEE 802.11 Modulated Output Power (in dBm)											
		SISO/SISO in MIMO Antenna R						SISO/SISO in MIMO Antenna L					
		a		ax (SU)		be (SU)		a		ax (SU)		be (SU)	
Maximum / Nominal Power		Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.
6 GHz WIFI (20MHz BW) - SP	UNII-5	15.0	14.0	15.0	14.0	15.0	14.0	15.0	14.0	15.0	14.0	15.0	14.0
	UNII-7	14.5	13.5	14.5	13.5	14.5	13.5	14.5	13.5	14.5	13.5	14.5	13.5
6 GHz WIFI (40MHz BW) - SP	UNII-5			15.0	14.0	15.0	14.0			15.0	14.0	15.0	14.0
	UNII-7			14.5	13.5	14.5	13.5			14.5	13.5	14.5	13.5
6 GHz WIFI (80MHz BW) - SP	UNII-5			15.0	14.0	15.0	14.0			15.0	14.0	15.0	14.0
	UNII-7			14.5	13.5	14.5	13.5			14.5	13.5	14.5	13.5
6 GHz WIFI (160MHz BW) - SP	UNII-5			15.0	14.0	15.0	14.0			15.0	14.0	15.0	14.0
	UNII-7			14.5	13.5	14.5	13.5			14.5	13.5	14.5	13.5
6 GHz WIFI (320MHz BW) - SP	UNII-5					15.0	14.0					15.0	14.0

The below table is applicable in the following conditions:

- Pmax, DSI=0 (Power Mode 1)
- DSI=1 (Power Mode 2)

Mode	Band	IEEE 802.11 Modulated Output Power (in dBm)											
		SISO/SISO in MIMO Antenna R						SISO/SISO in MIMO Antenna L					
		a		ax (SU)		be (SU)		a		ax (SU)		be (SU)	
Maximum / Nominal Power		Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.	Max	Nom.
6 GHz WIFI (20MHz BW) - LPI	UNII-5	0.5	-1.0	1.5	0.0	1.5	0.0	0.5	-1.0	1.5	0.0	1.5	0.0
	UNII-6	0.5	-1.0	0.5	-1.0	0.5	-1.0	0.5	-1.0	0.5	-1.0	0.5	-1.0
	UNII-7	0.5	-1.0	0.5	-1.0	0.5	-1.0	0.0	-1.0	0.5	-1.0	0.5	-1.0
	UNII-8	0.5 ch. 233: -3.0	-1.0 -4.5	0.5 ch. 233: -3.0	-1.0 -4.5	0.5 ch. 233: -3.0	-1.0 -4.5	0.5 ch. 233: -3.0	-1.0 -4.5	0.5 ch. 233: -3.0	-1.0 -4.5	0.5 ch. 233: -3.0	-1.0 -4.5
6 GHz WIFI (40MHz BW) - LPI	UNII-5			4.0	2.5	4.0	2.5			4.0	2.5	4.0	2.5
	UNII-6			4.0	2.5	4.0	2.5			4.0	2.5	4.0	2.5
	UNII-7			4.0	2.5	4.0	2.5			4.0	2.5	4.0	2.5
	UNII-8			4.0	2.5	4.0	2.5			4.0	2.5	4.0	2.5
6 GHz WIFI (80MHz BW) - LPI	UNII-5			6.5	5.5	6.5	5.5			6.5	5.5	6.5	5.5
	UNII-6			6.5	5.5	6.5	5.5			6.5	5.5	6.5	5.5
	UNII-7			7.0 ch. 119: 6.0	6.0 5.0	7.0 ch. 119: 6.0	6.0 5.0			7.0 ch. 119: 6.0	6.0 5.0	7.0 ch. 119: 6.0	6.0 5.0
	UNII-8			7.0	6.0	7.0	6.0			7.0	6.0	7.0	6.0
6 GHz WIFI (160MHz BW) - LPI	UNII-5			9.0	8.0	9.0	8.0			9.0	8.0	9.0	8.0
	UNII-6			9.0	8.0	9.0	8.0			9.0	8.0	9.0	8.0
	UNII-7			9.5	8.5	9.5	8.5			9.5	8.5	9.5	8.5
	UNII-8			6.5	5.5	6.5	5.5			6.5	5.5	6.5	5.5
6 GHz WIFI (320MHz BW) - LPI	UNII-5					11.5	10.5					11.5	10.5
	UNII-6					11.5	10.5					11.5	10.5
	UNII-7					12.0	11.0					12.0	11.0
	UNII-8					12.0	11.0					12.0	11.0

2.5.4 2.4 GHz Maximum Bluetooth Output Power

The below table is applicable in the following conditions:

- Bluetooth Power Mode A

Mode	Data Rate	Modulated Output Power (in dBm)					
		Single Antenna				Each Chain in Beamforming	
		Antenna R		Antenna L		MIMO	
Maximum / Nominal Power		Max	Nom.	Max	Nom.	Max	Nom.
Bluetooth	1Mbps	20.5	18.5	20.5	18.5	17.5	15.5
Bluetooth EDR	2Mbps	17.5	15.5	17.5	15.5	14.5	12.5
Bluetooth EDR	3Mbps	17.5	15.5	17.5	15.5	14.5	12.5
Bluetooth LE	1Mbps	19.5	17.5	19.5	17.5	16.5	14.5
Bluetooth LE	2Mbps	19.5	17.5	19.5	17.5	16.5	14.5
Bluetooth LE	125kbps	16.0	14.0	16.0	14.0	12.5	10.5
Bluetooth LE	500kbps	16.0	14.0	16.0	14.0	12.5	10.5

2.5.5 2.4 GHz Reduced Bluetooth Output Power

The below table is applicable in the following conditions:

- Bluetooth Power Mode B

Mode	Data Rate	Modulated Output Power (in dBm)					
		Single Antenna				Each Chain in Beamforming	
		Antenna R		Antenna L		MIMO	
Maximum / Nominal Power		Max	Nom.	Max	Nom.	Max	Nom.
Bluetooth	1Mbps	17.25	15.25	17.25	15.25	15.5	13.5
Bluetooth EDR	2Mbps	17.25	15.25	16.50	14.50	14.5	12.5
Bluetooth EDR	3Mbps	17.25	15.25	16.50	14.50	14.5	12.5
Bluetooth LE	1Mbps	17.25	15.25	17.25	15.25	15.0	13.0
Bluetooth LE	2Mbps	17.25	15.25	17.25	15.25	15.0	13.0
Bluetooth LE	125kbps	16.0	14.0	16.0	14.0	12.5	10.5
Bluetooth LE	500kbps	16.0	14.0	16.0	14.0	12.5	10.5

The below table is applicable in the following conditions:

- Bluetooth Power Mode C

Mode	Data Rate	Modulated Output Power (in dBm)					
		Single Antenna				Each Chain in Beamforming	
		Antenna R		Antenna L		MIMO	
Maximum / Nominal Power		Max	Nom.	Max	Nom.	Max	Nom.
Bluetooth	1Mbps	12.0	10.0	12.0	10.0	11.0	9.0
Bluetooth EDR	2Mbps	12.0	10.0	12.0	10.0	11.0	9.0
Bluetooth EDR	3Mbps	12.0	10.0	12.0	10.0	11.0	9.0
Bluetooth LE	1Mbps	12.0	10.0	12.0	10.0	11.0	9.0
Bluetooth LE	2Mbps	12.0	10.0	12.0	10.0	11.0	9.0
Bluetooth LE	125kbps	12.0	10.0	12.0	10.0	11.0	9.0
Bluetooth LE	500kbps	12.0	10.0	12.0	10.0	11.0	9.0

2.6 DUT Antenna Locations

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

Table 2-1
Device Edges/Sides for SAR Testing Power Mode 1

Antenna	Back	Front	Top	Bottom	Right	Left
R	No	No	No	Yes	No	No
L	No	No	No	Yes	No	No

Table 2-2
Device Edges/Sides for SAR Testing Power Mode 2

Antenna	Back	Front	Top	Bottom	Right	Left
R	Yes	No	Yes	No	No	No
L	Yes	No	Yes	No	No	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 D04v01. Additional edges may have been evaluated for simultaneous transmission analysis.

2.7 Simultaneous Transmission Capabilities

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

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

Table 2-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Power Mode 1	Power Mode 2
1	2.4 GHz WLAN MIMO	Yes	Yes
2	5 GHz WLAN MIMO	Yes	Yes
3	6 GHz WLAN MIMO	Yes	Yes
4	2.4 GHz Bluetooth Beam Forming	Yes	Yes
5	2.4 GHz WLAN Ant R + 2.4 GHz Bluetooth Ant L	Yes	Yes
6	2.4 GHz Bluetooth Ant R + 2.4 GHz WLAN Ant L	Yes	Yes
7	5 GHz WLAN Ant R + 2.4 GHz Bluetooth Ant L	Yes	Yes
8	6 GHz WLAN Ant R + 2.4 GHz Bluetooth Ant L	Yes	Yes
9	2.4 GHz Bluetooth Ant R + 5 GHz WLAN Ant L	Yes	Yes
10	2.4 GHz Bluetooth Ant R + 6 GHz WLAN Ant L	Yes	Yes
11	5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant R	Yes	Yes
12	6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant R	Yes	Yes
13	5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant L	Yes	Yes
14	6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant L	Yes	Yes
15	2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes
16	2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes
17	5 GHz WLAN MIMO + 2.4 GHz WLAN Ant R	Yes	Yes
18	6 GHz WLAN MIMO + 2.4 GHz WLAN Ant R	Yes	Yes
19	5 GHz WLAN MIMO + 2.4 GHz WLAN Ant L	Yes	Yes
20	6 GHz WLAN MIMO + 2.4 GHz WLAN Ant L	Yes	Yes
21	2.4 GHz Bluetooth Ant R + 2.4 GHz WLAN Ant L + 5 GHz WLAN Ant L	Yes	Yes
22	2.4 GHz Bluetooth Ant R + 2.4 GHz WLAN Ant L + 6 GHz WLAN Ant L	Yes	Yes
23	2.4 GHz WLAN Ant R + 5 GHz WLAN Ant R + 2.4 GHz Bluetooth Ant L	Yes	Yes
24	2.4 GHz WLAN Ant R + 6 GHz WLAN Ant R + 2.4 GHz Bluetooth Ant L	Yes	Yes
25	5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant R + 2.4 GHz WLAN Ant L	Yes	Yes
26	6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant R + 2.4 GHz WLAN Ant L	Yes	Yes
27	5 GHz WLAN MIMO + 2.4 GHz WLAN Ant R + 2.4 GHz Bluetooth Ant L	Yes	Yes
28	6 GHz WLAN MIMO + 2.4 GHz WLAN Ant R + 2.4 GHz Bluetooth Ant L	Yes	Yes
29	2.4 GHz WLAN Ant R + 5 GHz WLAN Ant L	Yes	Yes
30	2.4 GHz WLAN Ant R + 6 GHz WLAN Ant L	Yes	Yes
31	5 GHz WLAN Ant R + 2.4 GHz WLAN Ant L	Yes	Yes
32	6 GHz WLAN Ant R + 2.4 GHz WLAN Ant L	Yes	Yes
33	5 GHz WLAN Ant L + 2.4 GHz Bluetooth Ant L	Yes	Yes
34	6 GHz WLAN Ant L + 2.4 GHz Bluetooth Ant L	Yes	Yes
35	5 GHz WLAN Ant R + 2.4 GHz Bluetooth Ant R	Yes	Yes
36	6 GHz WLAN Ant R + 2.4 GHz Bluetooth Ant R	Yes	Yes
37	2.4 GHz WLAN MIMO + 5 GHz WLAN Ant R	Yes	Yes
38	2.4 GHz WLAN MIMO + 6 GHz WLAN Ant R	Yes	Yes
39	2.4 GHz WLAN MIMO + 5 GHz WLAN Ant L	Yes	Yes
40	2.4 GHz WLAN MIMO + 6 GHz WLAN Ant L	Yes	Yes
41	2.4 GHz WLAN Ant L + 5 GHz WLAN Ant L	Yes	Yes
42	2.4 GHz WLAN Ant L + 6 GHz WLAN Ant L	Yes	Yes
43	2.4 GHz WLAN Ant R + 5 GHz WLAN Ant R	Yes	Yes
44	2.4 GHz WLAN Ant R + 6 GHz WLAN Ant R	Yes	Yes
45	5 GHz WLAN MIMO + 2.4 GHz Bluetooth Beam Forming	Yes	Yes
46	6 GHz WLAN MIMO + 2.4 GHz Bluetooth Beam Forming	Yes	Yes
47	2.4 GHz WLAN Ant R + Wireless Charging NFC	Yes	Yes
48	2.4 GHz WLAN Ant L + Wireless Charging NFC	Yes	Yes
49	2.4 GHz Bluetooth Ant R + Wireless Charging NFC	Yes	Yes
50	2.4 GHz Bluetooth Ant L + Wireless Charging NFC	Yes	Yes
51	5 GHz WLAN Ant R + Wireless Charging NFC	Yes	Yes
52	5 GHz WLAN Ant L + Wireless Charging NFC	Yes	Yes
53	6 GHz WLAN Ant R + Wireless Charging NFC	Yes	Yes
54	6 GHz WLAN Ant L + Wireless Charging NFC	Yes	Yes

1. 2.4 GHz WLAN Antenna R and 2.4 GHz Bluetooth Ant R share the same antenna path and cannot transmit simultaneously.
2. 2.4 GHz WLAN Antenna L and 2.4 GHz Bluetooth Ant L share the same antenna path and cannot transmit simultaneously.
3. 5 GHz WLAN and 6 GHz WLAN share the same antenna path and cannot transmit simultaneously.
4. This device supports 2x2 MIMO Tx for WLAN 802.11b/a/g/n/ac/ax/be. 802.11b/a/g/n/ac/ax/be supports CDD and STBC and 802.11n/ac/ax/be additionally supports SDM.
5. This device supports Bluetooth Tethering.
6. For simultaneous scenarios 1-46, these WLAN simultaneous TX modes can also transmit simultaneously with the Wireless Charging NFC.

2.8 Miscellaneous SAR Test Considerations

(A) WIFI/BT

When U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02.

This device supports IEEE 802.11ac with the following features:

a) Up to 160 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/be with the following features:

a) Up to 320 MHz Bandwidth only for 6 GHz
b) Up to 160 MHz Bandwidth only for 5 GHz
c) Up to 40 MHz Bandwidth only for 2.4 GHz
d) 2 Tx antenna output
e) Up to 1024 QAM is supported
f) TDWR and Band gap channels are supported for 5/6 GHz
g) MU-MIMO UL Operations are not supported

Per FCC Guidance, 802.11ax/be RU/MRU was considered a higher order 802.11 mode when compared to a/b/g/n/ac/be to apply KDB Publication 248227 D01v02r02 for OFDM mode selection. Therefore, SAR tests were not required for 802.11ax/be RU/MRU based on the maximum allowed output powers of OFDM modes and the reported SAR values. Per FCC Guidance, maximum conducted powers were performed for each RU/MRU size to demonstrate that the output powers would not be higher than the other OFDM 802.11 modes. Please see RU/MRU SAR Exclusion Appendix of the reference report for 802.11ax/be RU/MRU output powers.

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

Per FCC guidance, SAR was performed using 6.5 GHz SAR probe calibration factors. FCC KDB 648474 and FCC KDB 248227 were followed for test positions, distances, and modes. Per TCB workshop October 2020 notes, channels were tested to cover the full range. Absorbed power density (APD) using a 4cm2 averaging area is reported based on SAR measurements. Incident power density is evaluated at 2mm ensuring that the resolution is sufficient such that integrated power density (iPD) between d=2mm and d=λ/5mm is ≥ -1dB per equipment manufacturer guidance. Power density results are scaled up for uncertainty above 30%.

2.9 Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D04v01 (Interim General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 616217 D04v01r02
- FCC KDB 648474 D04 (Accessories)
- IEC/IEEE 63195-1:2022
- IEC 62479:2010

- November 2017, October 2018, April 2019, November 2019, October 2020 TCB Workshop Notes (IEEE 802.11ax/be)
- SPEAG DASY6 System Handbook
- SPEAG DASY6 Application Note (Interim Procedures for Devices Operating at 6-10 GHz) (Nov 2021)

2.10 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 10 and Section 11.

2.11 Bibliography

Report Type	Report Serial Number
RF Exposure Part 0 Test Report – Reference Model	Appendix H: Part 0
RF Exposure Part 1 Test Report – Reference Model	Appendix H: Part 1
RF Exposure Part 2 Test Report – Reference Model	Appendix H: Part 2
RF Exposure Compliance Summary Report	1M2503050024-03.C3K

3 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 Device Under Test (DUT). 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.

3.1 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 3-1).

Equation 3-1
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]

4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

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

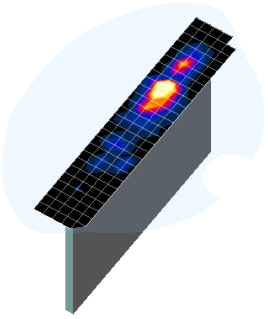

Figure 4-1
Sample SAR Area Scan

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 4-1) 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 4-1) 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 4-1. 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 4-1
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*Δz_{zoom}(n-1)	≥ 30
2-3 GHz	≤ 12	≤ 5	≤ 5	≤ 4	≤ 1.5*Δz_{zoom}(n-1)	≥ 30
3-4 GHz	≤ 12	≤ 5	≤ 4	≤ 3	≤ 1.5*Δz_{zoom}(n-1)	≥ 28
4-5 GHz	≤ 10	≤ 4	≤ 3	≤ 2.5	≤ 1.5*Δz_{zoom}(n-1)	≥ 25
5-6 GHz	≤ 10	≤ 4	≤ 2	≤ 2	≤ 1.5*Δz_{zoom}(n-1)	≥ 22

*Also compliant to IEEE 1528-2013 Table 6

5 TEST CONFIGURATION POSITIONS

5.1 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.

5.2 SAR Testing per KDB Publication 616217 D04v01r02

Per FCC KDB Publication 616217 D04v01r02, for devices containing a keyboard, SAR is required for the bottom surface and for devices with overall dimensions >200mm, the back surface and edges of the device should be tested for SAR compliance with the device touching the phantom. The SAR Exclusion Threshold in KDB 447498 D04v01 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent 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. Please see the exact antenna locations shown in the Technical Descriptions document.

6 RF EXPOSURE LIMITS

6.1 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.

6.2 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.

6.3 RF Exposure Limits for Frequencies Below 6 GHz

Table 6-1
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.

6.4 RF Exposure Limits for Frequencies Above 6 GHz

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

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

Table 6-2
Human Exposure Limits Specified in FCC 47 CFR §1.1310

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

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

7 FCC MEASUREMENT PROCEDURES

7.1 Measured and Reported SAR

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

7.2 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.

7.2.1 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.

7.2.2 U-NII-1 and U-NII-2A

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

7.2.3 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.

7.2.4 2.4 GHz SAR Test Requirements

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

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

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

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

7.2.5 OFDM Transmission Mode and SAR Test Channel Selection

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

7.2.6 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 7.2.5). When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

7.2.7 Subsequent Test Configuration Procedures

For OFDM configurations in each frequency band and aggregated band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position procedure. When the highest reported SAR

(for the initial test configuration), adjusted by the ratio of the specified maximum output power of the subsequent test configuration to initial test configuration, is ≤ 1.2 W/kg, no additional SAR tests for the subsequent test configurations are required. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

7.2.8 MIMO SAR considerations

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

8 RF CONDUCTED POWERS

8.1 WLAN Conducted Powers

Table 8-1
2.4 GHz WLAN Measured Power for Data Referencing – Antenna R

2.4GHz WIFI (20MHz 802.11b SISO ANT R)			
Freq. [MHz]	Channel	Detector	Conducted Power [dBm]
2462	11	Average	16.36

Table 8-2
5 GHz WLAN Measured Power for Data Referencing – Antenna R

5GHz WIFI (80MHz 802.11ac SISO ANT R)			
Band	Freq. [MHz]	Channel	Avg. Conducted Power [dBm]
UNII-4	5885	171	16.44

Table 8-3
5 GHz WLAN Measured Power for Data Referencing – Antenna L

5GHz WIFI (80MHz 802.11ac SISO ANT L)			
Band	Freq. [MHz]	Channel	Avg. Conducted Power [dBm]
UNII-4	5885	171	16.99

Table 8-4
6 GHz WLAN Measured Power for Data Referencing – Antenna R

6GHz WIFI (320MHz 802.11be SISO ANT R)			
Band	Freq. [MHz]	Channel	Avg. Conducted Power [dBm]
UNII-5	6105	31	14.44

6GHz WIFI (160MHz 802.11ax SISO ANTR)			
Band	Freq. [MHz]	Channel	Avg. Conducted Power [dBm]
UNII-7	6665	143	13.61

Table 8-5
6 GHz WLAN Measured Power for Data Referencing – Antenna L

6GHz WIFI (320MHz 802.11be SISO ANT L)			
Band	Freq. [MHz]	Channel	Avg. Conducted Power [dBm]
UNII-5	6105	31	14.53

6GHz WIFI (160MHz 802.11ax SISO ANT L)			
Band	Freq. [MHz]	Channel	Avg. Conducted Power [dBm]
UNII-7	6665	143	13.50

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

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

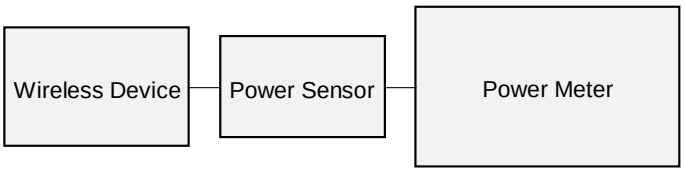

Figure 8-1
Power Measurement Setup

8.2 Bluetooth Conducted Powers

Table 8-6
Bluetooth Measured Power for Data Referencing – Antenna L

Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2480	1.0	GFSK	78	16.22	41.879

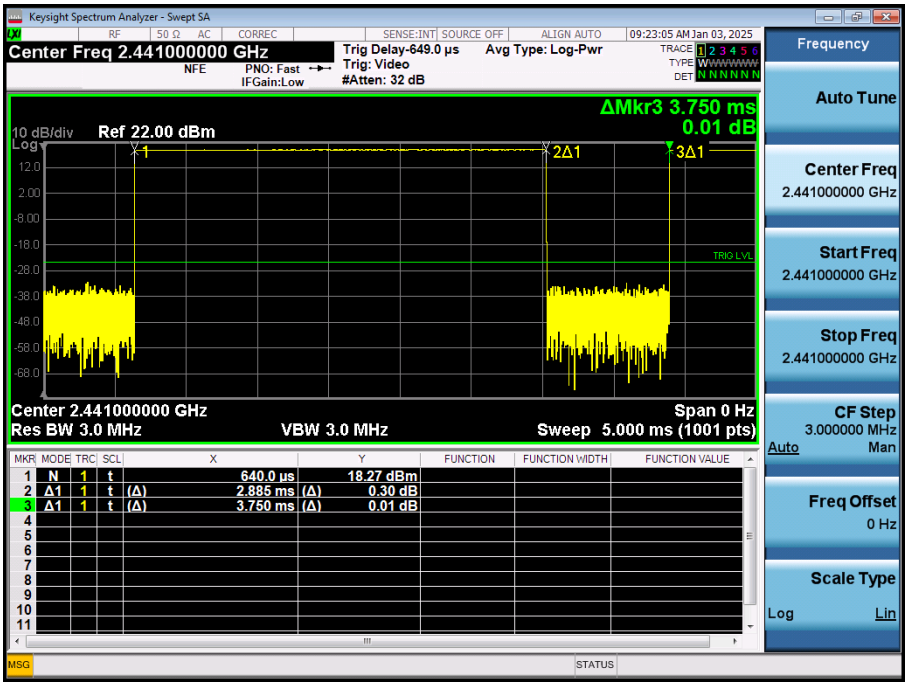

Figure 8-2
Bluetooth Transmission Plot – Antenna L

Equation 8-1
Bluetooth Antenna L Duty Cycle Calculation

$$Duty\ Cycle = \frac{Pulse\ Width}{Period} * 100\% = \frac{2.885ms}{3.75ms} * 100\% = 76.93\%$$

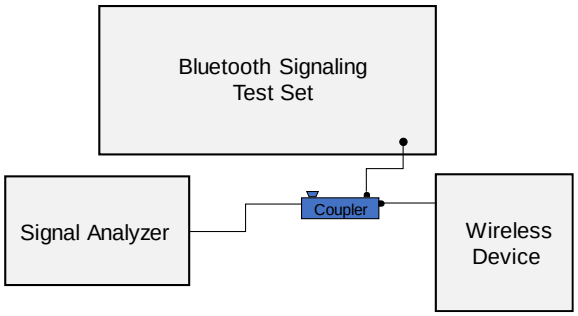

Figure 8-3
Power Measurement Setup

9 SYSTEM VERIFICATION

9.1 Tissue Verification

Table 9-1
Measured Head 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
01/15/2025	2450 Head	22.4	2300	1.727	39.447	1.670	39.500	3.41%	-0.13%
			2310	1.734	39.428	1.679	39.480	3.28%	-0.13%
			2320	1.742	39.408	1.687	39.460	3.26%	-0.13%
			2400	1.802	39.302	1.756	39.289	2.62%	0.03%
			2450	1.842	39.215	1.800	39.200	2.33%	0.04%
			2480	1.864	39.169	1.833	39.162	1.69%	0.02%
			2500	1.879	39.130	1.855	39.136	1.29%	-0.02%
			2510	1.887	39.112	1.866	39.123	1.13%	-0.03%
			2535	1.908	39.067	1.893	39.092	0.79%	-0.06%
			2550	1.920	39.050	1.909	39.073	0.58%	-0.06%
			2560	1.928	39.041	1.920	39.060	0.42%	-0.05%
			2600	1.959	38.974	1.964	39.009	-0.25%	-0.09%
			2650	2.000	38.883	2.018	38.945	-0.89%	-0.16%
			2680	2.024	38.837	2.051	38.907	-1.32%	-0.18%
			2700	2.040	38.799	2.073	38.882	-1.59%	-0.21%
01/22/2025	2450 Head	23.4	2300	1.709	38.118	1.670	39.500	2.34%	-3.50%
			2310	1.716	38.099	1.679	39.480	2.20%	-3.50%
			2320	1.724	38.083	1.687	39.460	2.19%	-3.49%
			2400	1.784	37.977	1.756	39.289	1.59%	-3.34%
			2450	1.823	37.889	1.800	39.200	1.28%	-3.34%
			2480	1.845	37.843	1.833	39.162	0.65%	-3.37%
			2500	1.859	37.803	1.855	39.136	0.22%	-3.41%
			2510	1.866	37.781	1.866	39.123	0.00%	-3.43%
			2535	1.887	37.737	1.893	39.092	-0.32%	-3.47%
			2550	1.899	37.718	1.909	39.073	-0.52%	-3.47%
			2560	1.907	37.707	1.920	39.060	-0.68%	-3.46%
			2600	1.936	37.642	1.964	39.009	-1.43%	-3.50%
			2650	1.977	37.550	2.018	38.945	-2.03%	-3.58%
			2680	2.000	37.508	2.051	38.907	-2.49%	-3.60%
			2700	2.014	37.469	2.073	38.882	-2.85%	-3.63%
01/13/2025	5200-5800 Head	19.5	5150	4.446	35.902	4.608	36.050	-3.52%	-0.41%
			5160	4.459	35.892	4.618	36.040	-3.44%	-0.41%
			5170	4.469	35.889	4.629	36.030	-3.46%	-0.39%
			5180	4.477	35.883	4.635	36.009	-3.41%	-0.35%
			5190	4.484	35.866	4.645	35.998	-3.47%	-0.37%
			5200	4.492	35.834	4.655	35.986	-3.50%	-0.42%
			5210	4.503	35.813	4.666	35.975	-3.49%	-0.45%
			5220	4.519	35.788	4.676	35.963	-3.36%	-0.49%
			5240	4.554	35.739	4.696	35.940	-3.02%	-0.56%
			5250	4.570	35.721	4.706	35.929	-2.89%	-0.58%
			5260	4.577	35.715	4.717	35.917	-2.97%	-0.56%
			5270	4.579	35.707	4.727	35.906	-3.13%	-0.55%
			5280	4.583	35.699	4.737	35.894	-3.25%	-0.54%
			5290	4.593	35.689	4.748	35.883	-3.26%	-0.54%
			5300	4.607	35.663	4.758	35.871	-3.17%	-0.58%
			5310	4.620	35.629	4.768	35.860	-3.10%	-0.64%
			5320	4.633	35.591	4.778	35.849	-3.03%	-0.72%
			5500	4.831	35.260	4.963	35.643	-2.66%	-1.07%
			5510	4.845	35.238	4.973	35.632	-2.57%	-1.11%
			5520	4.859	35.224	4.983	35.620	-2.49%	-1.11%
			5530	4.873	35.222	4.994	35.609	-2.42%	-1.09%
			5540	4.884	35.217	5.004	35.597	-2.40%	-1.07%
			5550	4.894	35.202	5.014	35.586	-2.39%	-1.08%
			5560	4.903	35.179	5.024	35.574	-2.41%	-1.11%
			5580	4.927	35.118	5.045	35.551	-2.34%	-1.22%
			5600	4.952	35.066	5.065	35.529	-2.23%	-1.30%
			5610	4.965	35.054	5.076	35.518	-2.19%	-1.31%
			5620	4.979	35.039	5.086	35.506	-2.10%	-1.32%
			5640	5.006	35.028	5.106	35.483	-1.96%	-1.28%
			5660	5.018	34.988	5.127	35.460	-2.13%	-1.33%
			5670	5.028	34.954	5.137	35.449	-2.12%	-1.40%
			5680	5.043	34.931	5.147	35.437	-2.02%	-1.43%
			5690	5.058	34.914	5.158	35.426	-1.94%	-1.45%
			5700	5.074	34.894	5.168	35.414	-1.82%	-1.47%
			5710	5.086	34.877	5.178	35.403	-1.78%	-1.49%
			5720	5.100	34.864	5.188	35.391	-1.70%	-1.49%
			5745	5.120	34.843	5.214	35.363	-1.80%	-1.47%
			5750	5.124	34.829	5.219	35.357	-1.82%	-1.49%
			5755	5.128	34.816	5.224	35.351	-1.84%	-1.51%
			5765	5.139	34.790	5.234	35.340	-1.82%	-1.56%
			5775	5.154	34.760	5.245	35.329	-1.73%	-1.61%
			5785	5.167	34.735	5.255	35.317	-1.67%	-1.65%
			5795	5.182	34.717	5.265	35.305	-1.58%	-1.67%
			5805	5.196	34.703	5.275	35.294	-1.50%	-1.67%
			5825	5.215	34.693	5.296	35.271	-1.53%	-1.64%
			5835	5.221	34.680	5.305	35.230	-1.58%	-1.56%
			5845	5.231	34.657	5.315	35.210	-1.58%	-1.57%
			5850	5.236	34.647	5.320	35.200	-1.58%	-1.57%
			5855	5.241	34.631	5.325	35.197	-1.58%	-1.61%
			5875	5.266	34.579	5.347	35.183	-1.51%	-1.72%
			5885	5.278	34.565	5.357	35.177	-1.47%	-1.74%
			5905	5.309	34.533	5.379	35.163	-1.30%	-1.79%
01/20/2025	6000 Head	19.2	5935	5.248	34.807	5.411	35.143	-3.01%	-0.96%
			5970	5.281	34.733	5.448	35.120	-3.07%	-1.10%
			5985	5.297	34.697	5.464	35.110	-3.06%	-1.18%
			6000	5.338	34.760	5.480	35.100	-2.59%	-0.97%
			6025	5.371	34.771	5.510	35.070	-2.52%	-0.85%
			6065	5.435	34.641	5.557	35.022	-2.20%	-1.09%
			6075	5.453	34.607	5.569	35.010	-2.08%	-1.15%
			6085	5.475	34.577	5.580	34.998	-1.88%	-1.20%
			6185	5.601	34.385	5.698	34.878	-1.70%	-1.41%
			6275	5.699	34.208	5.805	34.770	-1.83%	-1.62%
			6285	5.709	34.217	5.816	34.758	-1.84%	-1.56%
			6305	5.732	34.244	5.840	34.734	-1.85%	-1.41%
			6345	5.755	34.087	5.887	34.686	-2.24%	-1.73%
			6475	5.933	33.861	6.041	34.530	-1.79%	-1.94%
			6485	5.939	33.847	6.052	34.518	-1.87%	-1.94%
			6500	5.947	33.899	6.070	34.500	-2.03%	-1.74%
			6505	5.952	33.897	6.076	34.494	-2.04%	-1.73%
			6545	5.999	33.723	6.122	34.446	-2.01%	-2.10%
			6665	6.176	33.495	6.265	34.302	-1.42%	-2.35%
			6675	6.177	33.524	6.273	34.290	-1.53%	-2.23%
			6685	6.179	33.583	6.285	34.278	-1.69%	-2.03%
			6715	6.214	33.471	6.319	34.242	-1.66%	-2.25%
			6785	6.311	33.422	6.400	34.158	-1.39%	-2.15%
			6825	6.309	33.244	6.447	34.110	-2.14%	-2.54%
			6985	6.523	33.016	6.633	33.918	-1.66%	-2.66%
			6995	6.526	32.983	6.644	33.906	-1.78%	-2.72%
			7000	6.521	32.964	6.650	33.900	-1.94%	-2.76%
			7005	6.516	32.943	6.656	33.894	-2.10%	-2.81%
			7025	6.520	32.890	6.680	33.870	-2.40%	-2.89%

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.

9.2 Test System Verification

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

Table 9-2
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	DAE	Measured SAR 1g (W/kg)	1W Target SAR 1g (W/kg)	1W Normalized SAR 1g (W/kg)	Deviation 1g (%)	Measured SAR 10g (W/kg)	1W Target SAR 10g (W/kg)	1W Normalized SAR 10g (W/kg)	Deviation 10g (%)	Measured 4cm² APD (W/m²)	1W Target 4cm² APD (W/m²)	1W Normalized 4cm² APD (W/m²)	Deviation 4cm² APD (%)
J	2450	HEAD	01/15/2025	22.4	22.4	0.10	797	7406	1677	5.31	52.00	53.10	2.12%	2.49	24.40	24.90	2.05%	N/A	N/A	N/A	N/A
J	2450	HEAD	01/22/2025	24.5	23.4	0.10	981	7406	1677	5.23	51.80	52.30	0.97%	2.44	24.30	24.40	0.41%	N/A	N/A	N/A	N/A
S	5250	HEAD	01/13/2025	19.1	19.4	0.05	1191	7803	1583	3.73	78.90	74.60	-5.45%	1.08	22.70	21.60	-4.85%	N/A	N/A	N/A	N/A
S	5600	HEAD	01/13/2025	19.1	19.4	0.05	1191	7803	1583	4.04	83.00	80.80	-2.65%	1.17	23.90	23.40	-2.09%	N/A	N/A	N/A	N/A
S	5750	HEAD	01/13/2025	19.1	19.4	0.05	1191	7803	1583	3.93	78.90	78.60	-0.38%	1.14	22.40	22.80	1.79%	N/A	N/A	N/A	N/A
S	5850	HEAD	01/13/2025	19.1	19.4	0.05	1191	7803	1583	3.84	78.80	76.80	-2.54%	1.11	22.50	22.20	-1.33%	N/A	N/A	N/A	N/A
R	6500	HEAD	01/20/2025	19.2	19.2	0.03	1111	7527	1272	7.74	291.00	309.60	6.39%	1.45	53.50	58.00	8.41%	35.00	1300.00	1400.00	7.69%

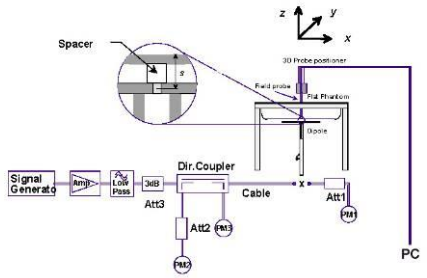

Figure 9-1
System Verification Setup Diagram

Figure 9-2
System Verification Setup Photo

9.3 Power Density Test System Verification

The system was verified to be within ±0.66 dB of the power density targets on the calibration certificate according to the test system specification in the user's manual and calibration facility recommendation. The 0.66 dB deviation threshold represents the expanded uncertainty for system performance checks using SPEAG's mmWave verification sources. The same spatial resolution and measurement region used in the source calibration was applied during the system check.

The measured power density distribution of verification source was also confirmed through visual inspection to have no noticeable differences, both spatially (shape) and numerically (level) from the distribution provided by the manufacturer, per November 2017 TCBC Workshop Notes.

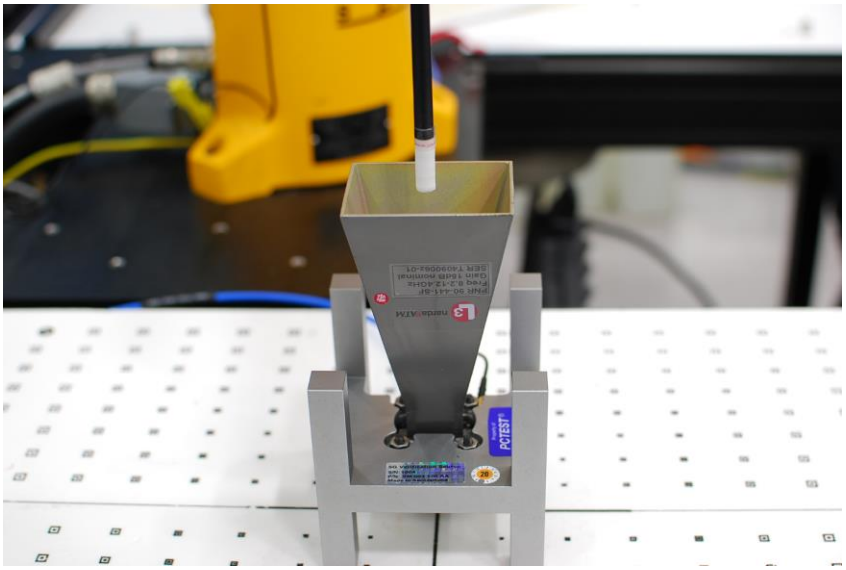

Figure 9-3
System Verification Setup Photo

Table 9-3
10 GHz Verifications

System	Frequency (GHz)	Date	Source S/N	Probe S/N	Prad (mW)	Normal psPD (W/m² over 4 cm²)		Deviation (dB)	Total psPD (W/m² over 4 cm²)		Deviation (dB)
						Measured	Target		Measured	Target	
Q	10	01/20/2025	1002	9622	93.3	60.50	54.60	0.45	60.90	54.90	0.45

Note: A **10 mm distance spacing** was used from the reference horn antenna aperture to the probe element.

10 SAR DATA SUMMARY

10.1 2.4 GHz WLAN SISO Standalone SAR

Table 10-1
2.4 GHz WLAN Antenna R Power Mode 2 – Spot-check Verification for Data Referencing | Plot A1

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported SAR for Reference Model (1g)
Body	2.4 GHz WiFi/ IEEE 802.11b	22	DSSS	R	4C624	97.84	-0.02	2462.00	11	1	17.25	16.36	Top	0	0.731	1.227	1.022	0.917	0.763
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram						

10.1 5 GHz WLAN Standalone SAR

Table 10-2
5 GHz WLAN Antenna R Power Mode 2 - Spot-check Verification for Data Referencing | Plot A2

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	U-NII band	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported SAR for Reference Model (1g)
Body	5 GHz WiFi/ IEEE 802.11ac	80	OFDM	R	4C424	99.12	-0.06	5855.00	171	U-NII-4	29.3	17.0	16.44	Top	0	0.817	1.138	1.009	0.938	0.992
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 10-3
5 GHz WLAN Antenna L Power Mode 2 - Spot-check Verification for Data Referencing | Plot A3

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	U-NII band	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported SAR for Reference Model (1g)
Body	5 GHz WiFi/ IEEE 802.11ac	80	OFDM	L	4C424	99.04	-0.05	5855.00	171	U-NII-4	29.3	17.0	16.99	Top	0	0.848	1.002	1.010	0.858	1.080
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Body 1.6 W/kg (mW/g) averaged over 1 gram						

10.2 6 GHz Standalone SAR

Table 10-4
6 GHz WLAN Antenna R Power Mode 2 - Spot-check Verification for Data Referencing | Plot A4

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported SAR for Reference Model (1g)
Body	6 GHz WiFi/ IEEE 802.11ax	160	OFDM	R	4C424	99.46	-0.08	6665.00	143	72.05	14.5	13.61	Top	0	0.782	1.227	1.005	0.964	0.861
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram						

Exposure	Band/ Mode	Bandwidth [MHz]	Service/ Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured APD [W/m² (4cm²)]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported APD [W/m² (4cm²)]	Report APD for Reference Model
Body	6 GHz WiFi/ IEEE 802.11ax	160	OFDM	R	4C424	99.46	-0.08	6665.00	143	72.05	14.5	13.61	Top	0	4.950	1.227	1.005	6.104	5.231

Table 10-5
6 GHz WLAN Antenna L Power Mode 2 - Spot-check Verification for Data Referencing | Plot A5

Exposure	Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported SAR for Reference Model (1g)
Body	6 GHz WiFi/ IEEE 802.11ax	160	OFDM	L	4BT24	99.50	0.10	6665.00	143	72.05	14.5	13.50	Top	0	0.537	1.259	1.005	0.679	0.649
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram						

Exposure	Band/ Mode	Bandwidth [MHz]	Service/ Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured APD [W/m² (4cm²)]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported APD [W/m² (4cm²)]	Report APD for Reference Model
Body	6 GHz WiFi/ IEEE 802.11ax	160	OFDM	L	4BT24	99.5	0.10	6665.00	143	72.05	14.5	13.50	Top	0	3.150	1.259	1.005	3.986	3.709

10.3 Bluetooth SISO Standalone SAR

Table 10-6
Bluetooth Antenna L Power Mode B – Spot-check Verification for Data Referencing | Plot A6

Exposure	Band / Mode	Service / Modulation	Ant.	Serial Number	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Measured 1g SAR [W/kg]	Power Scaling Factor	Duty Cycle Scaling Factor	Reported 1g SAR [W/kg]	Reported SAR for Reference Model (1g)
Body	2.4 GHz Bluetooth	FHSS	L	4C724	76.93	-0.03	2480.00	78	1	17.25	16.22	Top	0	0.387	1.268	1.014	0.498	0.883
ANSI/IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population												Body 1.6 W/kg (mW/g) averaged over 1 gram						

10.4 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, FCC KDB Publication 447498 D04v01, and FCC KDB Publication 616217 D04v01r02.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D04v01.
6. Per FCC KDB 865664 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were greater than or equal to 0.8 W/kg. Please see Section 12 of the reference report for variability analysis.
7. This device uses Qualcomm FastConnect TAS for WLAN operations to control and manage transmitting power in real time to ensure RF Exposure compliance. Per FCC Guidance, compliance was assessed at the minimum of the time averaged power and the maximum output power for each band/mode/exposure condition (DSI).
8. Per October 2020 TCB Workshop notes, absorbed power density (APD) using a 4cm2 averaging area is reported based on SAR measurements.
9. FCC KDB Publication 616217 D04v01r02 Section 4.3, SAR tests are required for the back surface and edges of the device with the device touching the phantom. The SAR Exclusion Threshold in FCC KDB 447498 D04v01 was applied to determine SAR test exclusion for adjacent edge configurations.
10. Per FCC KDB 616217 D04, SAR is evaluated for the bottom surface of a keyboard when it is attached to the DUT in Power Mode 1 configuration.
11. Per FCC Guidance, SAR tests are required for the back surface and edges of the device with the device 25mm away from the phantom when the motion sensor is not active. The SAR Exclusion Threshold in FCC KDB 447498 D04v01 was applied to determine SAR test exclusion for adjacent edge configurations.
12. The orange highlights throughout the report represent the highest scaled SAR per Equipment Class.
13. Per FCC KDB 484596 D01 v02r03, Section 3, the variant model maintains the same TAS implementation, RF exposure characteristics, and SAR compliance as the parent model, and spot-check measurements confirm no significant deviations (≤3 dB), the Power Reduction Verification (PRV) test data from the parent model remains valid and applicable without the need for additional PRV testing.
14. This device is the depopulated version of the fully populated reference model Appendix H. The worst-case configurations of reference model for each equipment class and antenna was selected for spot-check verification with the variant model. The spot-check verification results showed negligible impact of RF exposure from the depopulation therefore, the RF exposure data was referenced based on the reference model test results.

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/be) was not required

due to the maximum allowed powers and the highest reported DSSS SAR. See Section 7.2.4 for more information.

2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 5 GHz WIFI 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 7.2.5 for more information.
3. Per KDB Publication 248227 D01v02r02, SAR for MIMO was evaluated by following the simultaneous SAR provisions from KDB Publication 447498 D04v01 by either evaluating the sum of the 1g SAR values of each antenna transmitting independently or making a SAR measurement with both antennas transmitting simultaneously. Please see the Multi-Tx and Antenna SAR Considerations Appendix 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.
6. Per FCC guidance, SAR was performed using 6.5 GHz SAR probe calibration factors. Per October 2020 TCB Workshop notes, channels were tested to cover the entire range.

Bluetooth Notes

1. Bluetooth SAR was measured with the device connected to a call box with hopping disabled with DH5 operation and Tx Tests test mode type. Per October 2016 TCB Workshop Notes, the reported SAR was scaled to the 78% transmission duty factor for Bluetooth Antenna R and 78% transmission duty factor for Bluetooth Antenna L to determine compliance. See RF Conducted Power Section for the time domain plot and calculation for the duty factor of the device.

11 POWER DENSITY DATA SUMMARY

11.1 6 GHz WIFI Power Density Results

Table 11-2
6 GHz WLAN Power Mode 2 - Spot-check Verification for Data Referencing | Plot A7, A8

MEASUREMENT RESULTS																								
Frequency (MHz)	Channel	Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Power Drift (dB)	Spacing (mm)	Antenna Config.	DUT Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Grid Step (λ)	iPD (W/m²)	Scaling Factor for Measurement Uncertainty per IEC 62479	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Normal psPD (W/m²)	Scaled Normal psPD (W/m²)	Total psPD (W/m²)	Scaled Total psPD (W/m²)	Scaled Total psPD for Reference Model (W/m²)2
6105.00	31	802.11be	OFDM	320	15.00	14.44	-0.03	2	R	4BT24	144.11	Top	97.84	0.125	-	1.554	1.138	1.022	3.440	6.217	4.130	7.464	6.959
6105.00	31	802.11be	OFDM	320	15.00	14.53	0.13	2	L	4BT24	144.11	Top	97.51	0.125	-	1.554	1.114	1.026	1.810	3.215	2.360	4.192	7.053
47 CFR §1.1310 - SAFETY LIMIT Spatial Average Uncontrolled Exposure / General Population										Power Density 10 W/m² averaged over 4 cm²														

Power Density General Notes

1. The manufacturer has confirmed that the devices tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
2. Batteries are fully charged at the beginning of the measurements. The DUT was connected to a wall charger for some measurements due to the test duration. It was confirmed that the charger plugged into this DUT did not impact the near-field PD test results.
3. Power density was calculated by repeated E-field measurements on two measurement planes separated by λ/4.
4. 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.
5. Per FCC guidance and equipment manufacturer guidance, power density results were scaled according to IEC 62479:2010 for the portion of the measurement uncertainty > 30%. Total expanded uncertainty of 2.68 dB (85.4%) was used to determine the psPD measurement scaling factor.
6. Per equipment manufacturer guidance, power density was measured at d=2mm and d=λ/5mm using the same grid size and grid step size for some frequencies and surfaces. The integrated Power Density (iPD) was calculated based on these measurements. Since iPD ratio between the two distances is ≥ -1dB, the grid step was sufficient for determining compliance at d=2mm.
7. PTP-PR algorithm was used during psPD measurement and calculations.
8. PD results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D04.
9. Per October 2020 TCB Workshop notes, channels were tested to cover the entire range.

12 SAR MEASUREMENT VARIABILITY

12.1 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.

Please see Section 12 of the reference report for fulfillment of variability testing requirements.

12.2 Measurement Uncertainty

The measured SAR was <1.5 W/kg for 1g for all frequency bands. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEC/IEEE 62209-1528:2020 was not required.

13 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E4404B	Spectrum Analyzer	N/A	N/A	N/A	MY45113242
Agilent	E4438C	ESG Vector Signal Generator	10/23/2024	Annual	10/23/2025	MY45093852
Agilent	E4438C	ESG Vector Signal Generator	3/25/2024	Annual	3/25/2025	MY47270002
Agilent	N5182A	MXG Vector Signal Generator	7/9/2024	Annual	7/9/2025	MY48180366
Agilent	N5182A	MXG Vector Signal Generator	3/7/2024	Annual	3/7/2025	MY47420603
Agilent	8753ES	S-Parameter Vector Network Analyzer	9/25/2024	Annual	9/25/2025	MY40003841
Agilent	8753ES	S-Parameter Vector Network Analyzer	9/25/2024	Annual	9/25/2025	US39170118
Agilent	E5515C	Wireless Communications Test Set	CBT	N/A	CBT	GB46310798
Agilent	E5515C	Wireless Communications Test Set	CBT	N/A	CBT	US41140256
Agilent	N4010A	Wireless Connectivity Test Set	N/A	N/A	N/A	GB46170464
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433973
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433974
Amplifier Research	150A100C	Amplifier	CBT	N/A	CBT	350132
Anritsu	ML2496A	Power Meter	7/15/2024	Annual	7/15/2025	1138001
Anritsu	ML2496A	Power Meter	6/24/2024	Annual	6/24/2025	1840005
Anritsu	MA2411B	Pulse Power Sensor	9/5/2024	Annual	9/5/2025	1726262
Anritsu	MA2411B	Pulse Power Sensor	10/21/2024	Annual	10/21/2025	1027293
Anritsu	MA24106A	USB Power Sensor	7/10/2024	Annual	7/10/2025	1827530
Anritsu	MA24106A	USB Power Sensor	4/15/2024	Annual	4/15/2025	1827528
Mini-Circuits	PWR-4GHS	USB Power Sensor	6/12/2024	Annual	6/12/2025	12001070013
Control Company	4052	Long Stem Thermometer	2/27/2024	Biennial	2/27/2026	240174346
Control Company	4052	Long Stem Thermometer	2/27/2024	Biennial	2/27/2026	240171096
Control Company	4052	Long Stem Thermometer	2/27/2024	Biennial	2/27/2026	240171059
Control Company	4040	Therm./ Clock/ Humidity Monitor	4/15/2024	Biennial	4/15/2026	240310280
Control Company	4040	Therm./ Clock/ Humidity Monitor	4/15/2024	Biennial	4/15/2026	240310282
Control Company	S66279	Therm./ Clock/ Humidity Monitor	2/16/2024	Biennial	2/16/2026	240140051
Mitutoyo	500-196-30	CD-6"ASX 6Inch Digital Caliper	2/16/2022	Triennial	2/16/2025	A20238413
Keysight Technologies	N9020A	MXA Signal Analyzer	7/8/2024	Annual	7/8/2025	MY48010233
Agilent	N9020A	MXA Signal Analyzer	6/14/2024	Annual	6/14/2025	MY56470202
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
Mini-Circuits	VLF-6000+	Low Pass Filter DC to 6000 MHz	7/10/2024	Annual	7/10/2025	31634
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mini-Circuits	ZUDC10-83-S+	Directional Coupler	CBT	N/A	CBT	2050
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Seekonk	NC-100	Torque Wrench	CBT	N/A	CBT	22217
Seekonk	NC-100	Torque Wrench	4/2/2024	Biennial	4/2/2026	1262
SPEAG	DAK-3.5	Dielectric Assessment Kit	11/5/2024	Annual	11/5/2025	1277
SPEAG	DAKS-3.5	Portable Dielectric Assessment Kit	8/7/2024	Annual	8/7/2025	1041
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1237
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1331
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1390
SPEAG	DAK-12	Dielectric Assessment Kit (4MHz - 3GHz)	3/11/2024	Annual	3/11/2025	1102
SPEAG	D2450V2	2450 MHz SAR Dipole	11/15/2022	Biennial	3/21/2025	797
SPEAG	D2450V2	2450 MHz SAR Dipole	11/7/2024	Annual	11/7/2025	981
SPEAG	D5GHzV2	5 GHz SAR Dipole	1/17/2024	Annual	1/17/2025	1191
SPEAG	D6.5GHzV2	6 GHz SAR Dipole	2/22/2024	Annual	2/22/2025	1111
SPEAG	5G Verification Source 10GHz	10GHz System Verification Antenna	3/5/2024	Annual	3/5/2025	1002
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/8/2024	Annual	7/8/2025	1677
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/12/2024	Annual	3/12/2025	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/8/2024	Annual	7/8/2025	1583
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/10/2024	Annual	9/10/2025	1449
SPEAG	EX3DV4	SAR Probe	6/28/2024	Annual	6/28/2025	7803
SPEAG	EX3DV4	SAR Probe	7/5/2024	Annual	7/5/2025	7406
SPEAG	EX3DV4	SAR Probe	3/8/2024	Annual	3/8/2025	7527
SPEAG	EUmmWV4	EUmmWV4 Probe	2/2/2024	Annual	2/2/2025	9622

Note: 1) All equipment was used solely within its respective calibration period. 2) 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.

14 MEASUREMENT UNCERTAINTIES

Applicable for SAR Measurements < 6 GHz:

				f(d,k)			c x f/e	c x g/e	
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	1.73	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	1.73	1	1	0.1	0.1	∞
Modulation Response	E.2.5	4.8	R	1.73	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	1.73	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1	1	1.5	1.5	∞
RF Ambient Conditions - Noise	E.6.1	3	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	3	R	1.73	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.8	R	1.73	1	1	0.5	0.5	∞
Probe Positioning w/ respect to Phantom	E.6.3	6.7	R	1.73	1	1	3.9	3.9	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	4	R	1.73	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	1.73	1	1	2.9	2.9	∞
SAR Scaling	E.6.5	0	R	1.73	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	1.73	0.78	0.71	1.5	1.4	∞
Liquid Permittivity - Temperature Unceritainty	E.3.4	0.6	R	1.73	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

Applicable for SAR Measurements > 6 GHz:

Uncertainty Component	IEEE 1528 Sec.	Tol. (± %)	Prob. Dist.	f(d,k) Div.	c_i 1gm	c_i 10 gms	c x f/e 1gm u_i (± %)	c x g/e 10gms u_i (± %)	v_i
Measurement System									
Probe Calibration	E.2.1	9.3	N	1	1	1	9.3	9.3	∞
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	1.73	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	1.73	1	1	0.1	0.1	∞
Modulation Response	E.2.5	4.8	R	1.73	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	1.73	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1	1	1.5	1.5	∞
RF Ambient Conditions - Noise	E.6.1	3	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	3	R	1.73	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.8	R	1.73	1	1	0.5	0.5	∞
Probe Positioning w/ respect to Phantom	E.6.3	6.7	R	1.73	1	1	3.9	3.9	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	4	R	1.73	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	1.73	1	1	2.9	2.9	∞
SAR Scaling	E.6.5	0	R	1.73	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	1.73	0.78	0.71	1.5	1.4	∞
Liquid Permittivity - Temperature Unceritainty	E.3.4	0.6	R	1.73	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				13.8	13.6	191
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				27.6	27.1	

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

Applicable for Power Density Measurements:

a	b	c	d	e	f = c x f/e	g
Uncertainty Component	Unc. (± dB)	Prob. Dist.	Div.	c_i	u_i (± dB)	v_i
Measurement System						
Calibration	0.49	N	1	1	0.49	∞
Probe Correction	0.00	R	1.73	1	0.00	∞
Frequency Response	0.20	R	1.73	1	0.12	∞
Sensor Cross Coupling	0.00	R	1.73	1	0.00	∞
Isotropy	0.50	R	1.73	1	0.29	∞
Linearity	0.20	R	1.73	1	0.12	∞
Probe Scattering	0.00	R	1.73	1	0.00	∞
Probe Positioning offset	0.30	R	1.73	1	0.17	∞
Probe Positioning Repeatability	0.04	R	1.73	1	0.02	∞
Sensor MechanicalOffset	0.00	R	1.73	1	0.00	∞
Probe Spatial Resolution	0.00	R	1.73	1	0.00	∞
Field Impedence Dependance	0.00	R	1.73	1	0.00	∞
Amplitude and Phase Drift	0.00	R	1.73	1	0.00	∞
Amplitude and Phase Noise	0.04	R	1.73	1	0.02	∞
Measurement Area Truncation	0.00	R	1.73	1	0.00	∞
Data Acquisition	0.03	N	1	1	0.03	∞
Sampling	0.00	R	1.73	1	0.00	∞
Field Reconstruction	2.00	R	1.73	1	1.15	∞
Forward Transformation	0.00	R	1.73	1	0.00	∞
Power Density Scaling	0.00	R	1.73	1	0.00	∞
Spatial Averaging	0.10	R	1.73	1	0.06	∞
System Detection Limit	0.04	R	1.73	1	0.02	∞
Test Sample Related						
Probe Coupling with DUT	0.00	R	1.73	1	0.00	∞
Modulation Response	0.40	R	1.73	1	0.23	∞
Integration Time	0.00	R	1.73	1	0.00	∞
Response Time	0.00	R	1.73	1	0.00	∞
Device Holder Influence	0.10	R	1.73	1	0.06	∞
DUT alignment	0.00	R	1.73	1	0.00	∞
RF Ambient Conditions	0.04	R	1.73	1	0.02	∞
Ambient Reflections	0.04	R	1.73	1	0.02	∞
Immunity/Secondary Reception	0.00	R	1.73	1	0.00	∞
Drift of DUT	0.21	R	1.73	1	0.12	∞
Combined Standard Uncertainty (k=1)		RSS			1.34	∞
Expanded Uncertainty (95% CONFIDENCE LEVEL)		k=2				

15 CONCLUSION

15.1 Measurement Conclusion

The SAR evaluation indicates that the DUT 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]

16 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.

[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 Power Mode 1, Notebook, Netbook and Power Mode 2 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.