element

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WIFI 6 GHZ RF EXPOSURE EVALUATION

Applicant Name
Microsoft Corporation
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Redmond, WA 98052 USA
Microsoft Corporation

Date of Testing
04/06/2022 – 07/21/2022
Test Site/Location
Element, Columbia, MD, USA
Document Serial No:
1M2204040049-26.C3K (Rev 2)

FCC ID:	**C3K1997**
APPLICANT:	**MICROSOFT CORPORATION**

DUT Type:	Portable Computing Device
Application Type:	Certification
FCC Rule Part(s):	CFR §2.1093
Model:	1997

Band & Mode	Tx Frequency	SAR		APD		PD	PD
	MHz	1g Body (W/kg) - Tablet	1g Body (W/kg) - Laptop	Body (W/m^2) - Tablet	Body (W/m^2) - Laptop	psPD (W/m^2) - Tablet	psPD (W/m^2) - Laptop
WIFI 6 GHz	5935-7115	1.14	0.12	5.76	0.89	5.22	1.07

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

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

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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Tx Frequency
U-NII-5	5935 - 6415 MHz
U-NII-6	6435 - 6515 MHz
U-NII-7	6535 - 6875 MHz
U-NII-8	6895 - 7115 MHz

1.2 Nominal and Maximum Output Power Specifications

The 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 D04.

1.2.1 Maximum WLAN Output Power

Mode	IEEE 802.11 (in dBm)											
	Antenna 1				Antenna 2				MIMO			
	a (CDD + STBC)		ax (SU) (CDD + STBC, SDM)		a (CDD + STBC)		ax (SU) (CDD + STBC, SDM)		a (CDD + STBC)		ax (SU) (CDD + STBC, SDM)	
	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum
6 GHz WIFI (20MHz BW)	4.5	6.5	5.0 Ch. 233: 1.5	7.0 Ch. 233: 3.5	4.5	6.5	5.0 Ch. 233: 1.5	7.0 Ch. 233: 3.5	-0.75	1.25	2.0	4.0
6 GHz WIFI (40MHz BW)			8.0	10.0			8.0	10.0			4.5	6.5
6 GHz WIFI (80MHz BW)			11.0	13.0			11.0	13.0			7.5	9.5
6 GHz WIFI (160MHz BW)			14.0	16.0			14.0	16.0			10.0	12.0

1.2.2 Reduced WLAN Output Power

The below table is applicable in the following conditions:
• Tablet Mode Active

Mode	IEEE 802.11 (in dBm)															
	Antenna 1				Antenna 2				MIMO Antenna 1				MIMO Antenna 2			
	a (CDD + STBC)		ax (SU) (CDD + STBC, SDM)		a (CDD + STBC)		ax (SU) (CDD + STBC, SDM)		a (CDD + STBC)		ax (SU) (CDD + STBC, SDM)		a (CDD + STBC)		ax (SU) (CDD + STBC, SDM)	
	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum
6 GHz WIFI (20MHz BW)	4.5	6.5	5.0 Ch. 233: 1.5	7.0 Ch. 233: 3.5	4.5	6.5	5.0 Ch. 233: 1.5	7.0 Ch. 233: 3.5	-3.75	-1.75	-1.0	1.0	-3.75	-1.75	-1.0	1.0
6 GHz WIFI (40MHz BW)			6.5	8.5			6.5 UNII-8: 6	8.5 UNII-8: 8			1.5	3.5			1.5	3.5
6 GHz WIFI (80MHz BW)			6.5	8.5			6.5 UNII-8: 6	8.5 UNII-8: 8			4.5	6.5			4.5	6.5
6 GHz WIFI (160MHz BW)			6.5	8.5			6.5 UNII-8: 6	8.5 UNII-8: 8			6.5	8.5			6.5 UNII-8: 6	8.5 UNII-8: 8

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

The below table is applicable in the following conditions:
• Tablet mode active with simultaneous conditions with 2.4 GHz WLAN

Mode	IEEE 802.11 (in dBm)															
	Antenna 1				Antenna 2				MIMO Antenna 1				MIMO Antenna 2			
	a (CDD + STBC)		ax (SU) (CDD + STBC, SDM)		a (CDD + STBC)		ax (SU) (CDD + STBC, SDM)		a (CDD + STBC)		ax (SU) (CDD + STBC, SDM)		a (CDD + STBC)		ax (SU) (CDD + STBC, SDM)	
	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum
6 GHz WIFI (20MHz BW)	1.0	3.0	1.0	3.0	3.0 UNII-8: 2	5.0 UNII-8: 4	3.0 UNII-8: 1.5	5.0 UNII-8: 3.5	-3.75	-1.75	-1.0	1.0	-3.75	-1.75	-1.0	1.0
6 GHz WIFI (40MHz BW)			1.0	3.0			3.0 UNII-8: 2	5.0 UNII-8: 4			1.0	3.0			1.5	3.5
6 GHz WIFI (80MHz BW)			1.0	3.0			3.0 UNII-8: 2	5.0 UNII-8: 4			1.0	3.0			3.0 UNII-8: 2	5.0 UNII-8: 4
6 GHz WIFI (160MHz BW)			1.0	3.0			3.0 UNII-8: 2	5.0 UNII-8: 4			1.0	3.0			3.0 UNII-8: 2	5.0 UNII-8: 4

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

1.2.3 Maximum 802.11ax RU WLAN Output Power

Mode	Band	IEEE 802.11AX RU (in dBm)						
			SISO		MIMO			
			Antenna 1 & Antenna 2		Antenna 1		Antenna 2	
		Tones	6 GHz					
			Nominal	Maximum	Nominal	Maximum	Nominal	Maximum
6 GHz WIFI (20MHz BW & Partial BWs)	UNII-5	26T	-4.0	-2.0	-10.0	-8.0	-10.0	-8.0
	UNII-6		-3.5	-1.5	-10.0	-8.0	-10.0	-8.0
	UNII-7		-3.5	-1.5	-10.0	-8.0	-10.0	-8.0
	UNII-8		-3.5 ch. 233: -6.0	-1.5 ch. 233: -4.0	-10.0	-8.0	-10.0	-8.0
	UNII-5	52T	-3.0	-1.0	-7.0	-5.0	-7.0	-5.0
	UNII-6		-3.0	-1.0	-7.0	-5.0	-7.0	-5.0
	UNII-7		-3.0	-1.0	-7.0	-5.0	-7.0	-5.0
	UNII-8		-3.0 ch. 233: -5.0	-1.0 ch. 233: -3.0	-7.0 ch. 233: -8.0	-5.0 ch. 233: -6.0	-7.0 ch. 233: -8.0	-5.0 ch. 233: -6.0
	UNII-5	106T	-0.5	1.5	-3.5	-1.5	-3.5	-1.5
	UNII-6		-0.5	1.5	-3.5	-1.5	-3.5	-1.5
	UNII-7		-0.5	1.5	-3.5	-1.5	-3.5	-1.5
	UNII-8		-0.5 ch. 233: -3.5	1.5 ch. 233: -1.5	-3.5 ch. 233: -5.5	-1.5 ch. 233: -3.5	-3.5 ch. 233: -5.5	-1.5 ch. 233: -3.5
	UNII-5	242T	5.0	7.0	-1.0	1.0	-1.0	1.0
	UNII-6		5.0	7.0	-1.0	1.0	-1.0	1.0
	UNII-7		5.0	7.0	-1.0	1.0	-1.0	1.0
	UNII-8		5.0 ch. 233: 1.5	7.0 ch. 233: 3.5	-1.0	1.0	-1.0	1.0
6 GHz WIFI (40MHz BW & Partial BWs)	UNII-5	484T	8.0	10.0	1.5	3.5	1.5	3.5
	UNII-6		8.0	10.0	1.5	3.5	1.5	3.5
	UNII-7		8.0	10.0	1.5	3.5	1.5	3.5
	UNII-8		8.0	10.0	1.5	3.5	1.5	3.5
6 GHz WIFI (80MHz BW & Partial BWs)	UNII-5	996T	11.0	13.0	4.5	6.5	4.5	6.5
	UNII-6		11.0	13.0	4.5	6.5	4.5	6.5
	UNII-7		11.0	13.0	4.5	6.5	4.5	6.5
	UNII-8		11.0	13.0	4.5	6.5	4.5	6.5
6 GHz WIFI (160MHz BW)	UNII-5	996T*2	14.0	16.0	7.0	9.0	7.0	9.0
	UNII-6		14.0	16.0	7.0	9.0	7.0	9.0
	UNII-7		14.0	16.0	7.0	9.0	7.0	9.0
	UNII-8		14.0	16.0	7.0	9.0	7.0	9.0

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

1.2.4 Reduced 802.11ax RU WLAN Output Power

The below table is applicable in the following conditions:
• Tablet Mode Active

Mode	Band	IEEE 802.11AX RU (in dBm)							
			SISO				MIMO		
			Antenna 1		Antenna 2		Antenna 1		Antenna 2
		Tones	6 GHz						
			Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum
6 GHz WIFI (20MHz BW & Partial BWs)	UNII-5	26T	-4.0	-2.0	-4.0	-2.0	-10.0	-8.0	-10.0	-8.0
	UNII-6		-3.5	-1.5	-3.5	-1.5	-10.0	-8.0	-10.0	-8.0
	UNII-7		-3.5	-1.5	-3.5	-1.5	-10.0	-8.0	-10.0	-8.0
	UNII-8		-3.5 ch. 233: -6.0	-1.5 ch. 233: -4.0	-3.5 ch. 233: -6.0	-1.5 ch. 233: -4.0	-10.0	-8.0	-10.0	-8.0
	UNII-5	52T	-3.0	-1.0	-3.0	-1.0	-7.0	-5.0	-7.0	-5.0
	UNII-6		-3.0	-1.0	-3.0	-1.0	-7.0	-5.0	-7.0	-5.0
	UNII-7		-3.0	-1.0	-3.0	-1.0	-7.0	-5.0	-7.0	-5.0
	UNII-8		-3.0 ch. 233: -5.0	-1.0 ch. 233: -3.0	-3.0 ch. 233: -5.0	-1.0 ch. 233: -3.0	-7.0 ch. 233: -8.0	-5.0 ch. 233: -6.0	-7.0 ch. 233: -8.0	-5.0 ch. 233: -6.0
	UNII-5	106T	-0.5	1.5	-0.5	1.5	-3.5	-1.5	-3.5	-1.5
	UNII-6		-0.5	1.5	-0.5	1.5	-3.5	-1.5	-3.5	-1.5
	UNII-7		-0.5	1.5	-0.5	1.5	-3.5	-1.5	-3.5	-1.5
	UNII-8		-0.5 ch. 233: -3.5	1.5 ch. 233: -1.5	-0.5 ch. 233: -3.5	1.5 ch. 233: -1.5	-3.5 ch. 233: -5.5	-1.5 ch. 233: -3.5	-3.5 ch. 233: -5.5	-1.5 ch. 233: -3.5
	UNII-5	242T	5.0	7.0	5.0	7.0	-1.0	1.0	-1.0	1.0
	UNII-6		5.0	7.0	5.0	7.0	-1.0	1.0	-1.0	1.0
	UNII-7		5.0	7.0	5.0	7.0	-1.0	1.0	-1.0	1.0
	UNII-8		5.0 ch. 233: 1.5	7.0 ch. 233: 3.5	5.0 ch. 233: 1.5	7.0 ch. 233: 3.5	-1.0	1.0	-1.0	1.0
6 GHz WIFI (40MHz BW & Partial BWs)	UNII-5	484T	6.5	8.5	6.5	8.5	1.5	3.5	1.5	3.5
	UNII-6		6.5	8.5	6.5	8.5	1.5	3.5	1.5	3.5
	UNII-7		6.5	8.5	6.5	8.5	1.5	3.5	1.5	3.5
	UNII-8		6.5	8.5	6.0	8.0	1.5	3.5	1.5	3.5
6 GHz WIFI (80MHz BW & Partial BWs)	UNII-5	996T	6.5	8.5	6.5	8.5	4.5	6.5	4.5	6.5
	UNII-6		6.5	8.5	6.5	8.5	4.5	6.5	4.5	6.5
	UNII-7		6.5	8.5	6.5	8.5	4.5	6.5	4.5	6.5
	UNII-8		6.5	8.5	6.0	8.0	4.5	6.5	4.5	6.5
6 GHz WIFI (160MHz BW)	UNII-5	996T*2	6.5	8.5	6.5	8.5	6.5	8.5	6.5	8.5
	UNII-6		6.5	8.5	6.5	8.5	6.5	8.5	6.5	8.5
	UNII-7		6.5	8.5	6.5	8.5	6.5	8.5	6.5	8.5
	UNII-8		6.5	8.5	6.0	8.0	6.5	8.5	6.0	8.0

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

The below table is applicable in the following conditions:
• Tablet mode active with simultaneous conditions with 2.4 GHz WLAN

Mode	Band	IEEE 802.11AX RU (in dBm)							
			SISO				MIMO		
			Antenna 1		Antenna 2		Antenna 1		Antenna 2
		Tones	6 GHz						
			Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum
6 GHz WIFI (20MHz BW & Partial BWs)	UNII-5	26T	-4.0	-2.0	-4.0	-2.0	-10.0	-8.0	-10.0	-8.0
	UNII-6		-3.5	-1.5	-3.5	-1.5	-10.0	-8.0	-10.0	-8.0
	UNII-7		-3.5	-1.5	-3.5	-1.5	-10.0	-8.0	-10.0	-8.0
	UNII-8		-3.5 ch. 233: -6.0	-1.5 ch. 233: -4.0	-3.5 ch. 233: -6.0	-1.5 ch. 233: -4.0	-10.0	-8.0	-10.0	-8.0
	UNII-5	52T	-3.0	-1.0	-3.0	-1.0	-7.0	-5.0	-7.0	-5.0
	UNII-6		-3.0	-1.0	-3.0	-1.0	-7.0	-5.0	-7.0	-5.0
	UNII-7		-3.0	-1.0	-3.0	-1.0	-7.0	-5.0	-7.0	-5.0
	UNII-8		-3.0 ch. 233: -5.0	-1.0 ch. 233: -3.0	-3.0 ch. 233: -5.0	-1.0 ch. 233: -3.0	-7.0 ch. 233: -8.0	-5.0 ch. 233: -6.0	-7.0 ch. 233: -8.0	-5.0 ch. 233: -6.0
	UNII-5	106T	-0.5	1.5	-0.5	1.5	-3.5	-1.5	-3.5	-1.5
	UNII-6		-0.5	1.5	-0.5	1.5	-3.5	-1.5	-3.5	-1.5
	UNII-7		-0.5	1.5	-0.5	1.5	-3.5	-1.5	-3.5	-1.5
	UNII-8		-0.5 ch. 233: -3.5	1.5 ch. 233: -1.5	-1.0 ch. 233: -3.5	1.0 ch. 233: -1.5	-3.5 ch. 233: -5.5	-1.5 ch. 233: -3.5	-3.5 ch. 233: -5.5	-1.5 ch. 233: -3.5
	UNII-5	242T	1.0	3.0	3.0	5.0	-1.0	1.0	-1.0	1.0
	UNII-6		1.0	3.0	3.0	5.0	-1.0	1.0	-1.0	1.0
	UNII-7		1.0	3.0	3.0	5.0	-1.0	1.0	-1.0	1.0
	UNII-8		1.0	3.0	2.0	4.0	-1.0	1.0	-1.0	1.0
6 GHz WIFI (40MHz BW & Partial BWs)	UNII-5	484T	1.0	3.0	3.0	5.0	1.0	3.0	1.5	3.5
	UNII-6		1.0	3.0	3.0	5.0	1.0	3.0	1.5	3.5
	UNII-7		1.0	3.0	3.0	5.0	1.0	3.0	1.5	3.5
	UNII-8		1.0	3.0	2.0	4.0	1.0	3.0	1.5	3.5
6 GHz WIFI (80MHz BW & Partial BWs)	UNII-5	996T	1.0	3.0	3.0	5.0	1.0	3.0	3.0	5.0
	UNII-6		1.0	3.0	3.0	5.0	1.0	3.0	3.0	5.0
	UNII-7		1.0	3.0	3.0	5.0	1.0	3.0	3.0	5.0
	UNII-8		1.0	3.0	2.0	4.0	1.0	3.0	2.0	4.0
6 GHz WIFI (160MHz BW)	UNII-5	996T*2	1.0	3.0	3.0	5.0	1.0	3.0	3.0	5.0
	UNII-6		1.0	3.0	3.0	5.0	1.0	3.0	3.0	5.0
	UNII-7		1.0	3.0	3.0	5.0	1.0	3.0	3.0	5.0
	UNII-8		1.0	3.0	2.0	4.0	1.0	3.0	2.0	4.0

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

1.3 DUT Antenna Locations

The overall diagonal dimension of the device is > 200 mm. A diagram showing the location of the device antennas can be found in SAR Part 1 Report, DUT Antenna Diagram & SAR Test Setup Photographs Appendix. Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC filing.

Table 1-1
Device Surfaces - Tablet

Device Sides/Edges for Testing						
Mode	Back	Front	Top	Bottom	Right	Left
6 GHz WLAN Ant 1	Yes	Yes	No	No	No	Yes
6 GHz WLAN Ant 2	Yes	Yes	No	No	Yes	No

Table 1-2
Device Surfaces – Laptop

Device Sides/Edges for Testing						
Mode	Back	Front	Top	Bottom	Right	Left
6 GHz WLAN Ant 1	No	No	No	Yes	No	No
6 GHz WLAN Ant 2	No	No	No	Yes	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 D04. Additional edges may have been evaluated for simultaneous transmission analysis.

1.4 Miscellaneous Testing Considerations

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, 5 channels were tested. Absorbed power density (APD) using a 4cm^2 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%.

6 GHz WIFI SAR results are used for simultaneous transmission analysis with the other BT/WIFI transmitters. Analysis can be found in SAR report.

To make the most efficient use of the additional available subcarriers (data tones), IEEE 802.11ax can utilize Orthogonal Frequency-Division Multiple Access (OFDMA) which divides the existing 802.11 channels into smaller subchannels called Resource Units (RUs). Possible RU sizes are: 26T, 52T, 106T, 242T, 484T, 996T, and 996T*2.

Per FCC Guidance, 802.11ax RU was considered a higher order 802.11 mode when compared to a/b/g/n/ac to apply KDB Publication 248227 D01v02r02 for OFDM mode selection. Therefore, SAR tests were not required for 802.11ax RU 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 size to demonstrate that the output powers would not be higher than the other OFDM 802.11 modes. Please see Measurement Report SN 1M2204040049-02.C3K for 802.11ax RU output powers.

1.5 Guidance Applied

- November 2017, October 2018, April 2019, November 2019, October 2020 TCBC Workshop Notes
- SPEAG DASY6 System Handbook
- SPEAG DASY6 Application Note (Interim Procedures for Devices Operating at 6-10 GHz) (Nov 2021)
- IEEE 1528-2013
- IEC TR 63170:2018
- IEC 62479:2010
- FCC KDB 865664 D02 v01r02
- FCC KDB 648474 D04 v01r03
- FCC KDB 248227 D01 v02r02
- FCC KDB 447498 D04
- FCC KDB 865664 D01 v01r04
- April 2019 TCB Workshop Notes (IEEE 802.11ax)
- FCC KDB Publication 616217 D04v01r02

1.6 Device Serial Numbers

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

2 INTRODUCTION

The FCC and Innovation, Science, and Economic Development Canada have adopted the guidelines for evaluating the environmental effects of radio frequency (RF) radiation in ET Docket 93-62 on Aug. 6, 1996, and Health Canada Safety Code 6 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. [15]

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 [44] and Health Canada RF Exposure Guidelines Safety Code 6 [35]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [17] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

2.1 SAR Definition

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

Equation 2-1
SAR Mathematical Equation

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

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

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

where:

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

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relation to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.[20]

3 DOSIMETRIC ASSESSMENT

3.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04 and IEEE1528-2013:

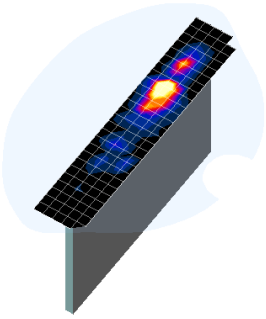

Figure 3-1
Sample SAR Area Scan

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface, and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 3-1) and IEEE1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 3-1) and IEEE1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):

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

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

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

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

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

*Also compliant to IEEE 1528-2013 Table 6

4 TEST CONFIGURATION POSITIONS

4.1 Device Holder

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

4.2 SAR Testing for Tablet per KDB Publication 616217 D04v01r02

Per FCC KDB Publication 616217 D04v01r02, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR Exclusion Threshold in KDB 447498 D04 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

5 RF EXPOSURE LIMITS

5.1 Uncontrolled Environment

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

5.2 Controlled Environment

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

5.3 RF Exposure Limits for Frequencies Below 6 GHz

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

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

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

5.4 RF Exposure Limits for Frequencies Above 6 GHz

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

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

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

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

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

6 MEASUREMENT PROCEDURES

6.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D04, when SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as *reported* SAR. The highest *reported* SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

6.2 SAR Testing with 802.11 Transmitters

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

6.2.1 General Device Setup

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

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

6.2.2 OFDM Transmission Mode and SAR Test Channel Selection

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

6.2.3 Initial Test Configuration Procedure

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

When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurements (See Section 6.2.2). When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

6.2.4 Subsequent Test Configuration Procedures

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

6.2.5 MIMO SAR Considerations

Per KDB Publication 248227 D01v02r02, the simultaneous SAR provisions in KDB Publication 447498 D04 should be applied to determine simultaneous transmission SAR test exclusion for WIFI MIMO. If the sum of 1g single transmission chain SAR measurements is <1.6 W/kg, no additional SAR measurements for MIMO are required. Alternatively, SAR for MIMO can be measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

7 RF CONDUCTED POWERS

Table 7-1
6 GHz WLAN Maximum Average RF Power – 802.11a 20 MHz BW

Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11a	
		Ant 1	Ant 2
6075	25	5.98	6.54
6275	65	5.92	6.59
6475	105	6.47	6.54
6675	145	6.25	6.63
6995	209	6.32	6.65

Table 7-2
6 GHz WLAN Maximum Average RF Power – 802.11ax 20 MHz BW

6GHz (20MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11ax	
		Ant 1	Ant 2
6075	25	6.25	6.32
6275	65	6.27	6.30
6475	105	5.91	6.77
6675	145	6.29	6.81
6995	209	5.41	6.07

Table 7-3
6 GHz WLAN Maximum Average RF Power – 802.11ax 40 MHz BW

6GHz (40MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11ax	
		Ant 1	Ant 2
6085	27	9.05	9.79
6285	67	8.91	9.59
6485	107	9.20	9.54
6685	147	9.29	9.37
7005	211	9.21	9.33

Table 7-4
6 GHz WLAN Maximum Average RF Power – 802.11ax 80 MHz BW

6GHz (80MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11ax	
		Ant 1	Ant 2
6065	23	12.23	12.46
6305	71	12.34	12.70
6545	119	12.34	12.79
6785	167	12.60	12.98
7025	215	12.39	12.83

Table 7-5
6 GHz WLAN Reduced Average RF Power – 802.11ax 80 MHz BW

The below table is applicable in the following conditions:
• Tablet Mode Active

6GHz (80MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11ax	
		Ant 1	Ant 2
6065	23	7.96	7.81
6305	71	7.98	7.41
6545	119	8.02	7.71
6785	167	7.94	7.92
7025	215	7.97	6.92

The below table is applicable in the following conditions:
• Tablet mode active with simultaneous conditions with 2.4 GHz WLAN

6GHz (80MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11ax	
		Ant 1	Ant 2
6065	23	2.01	3.40
6305	71	2.10	3.18
6545	119	1.62	3.48
6785	167	1.47	3.30
7025	215	1.66	2.54

Table 7-6
6 GHz WLAN Maximum Average RF Power – 802.11ax 160 MHz BW

Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11ax	
		Ant 1	Ant 2
6025	15	15.12	15.66
6345	79	15.19	15.34
6505	111	15.43	15.51
6825	175	15.47	15.48
6985	207	15.19	15.64

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 identical maximum specified output power, channel bandwidth, modulation and data rates, power measurements were required for all identical configurations.

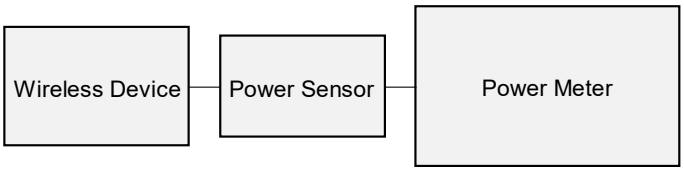

Figure 7-1
Power Measurement Setup

8 SYSTEM VERIFICATION

8.1 SAR Test System Verification

Table 8-1
Measured Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	% dev σ	% dev ε
04/13/2022	6500 Head	23.5	6065	5.631	34.693	5.557	35.022	1.33%	-0.94%
			6305	5.950	34.252	5.840	34.734	1.88%	-1.39%
			6500	6.155	33.876	6.070	34.500	1.40%	-1.81%
			6545	6.219	33.694	6.122	34.446	1.58%	-2.18%
			6785	6.510	33.485	6.400	34.158	1.72%	-1.97%
			7025	6.665	32.641	6.680	33.870	-0.22%	-3.63%
04/18/2022	6500 Head	20.6	5935	5.538	34.874	5.411	35.143	2.35%	-0.77%
			5970	5.572	34.661	5.448	35.120	2.28%	-1.31%
			5985	5.612	34.617	5.464	35.110	2.71%	-1.40%
			6065	5.656	34.443	5.557	35.022	1.78%	-1.65%
			6075	5.677	34.402	5.569	35.010	1.94%	-1.74%
			6085	5.698	34.366	5.580	34.998	2.11%	-1.81%
			6275	5.946	34.037	5.805	34.770	2.43%	-2.11%
			6285	5.951	34.014	5.816	34.758	2.32%	-2.14%
			6305	5.969	33.996	5.840	34.734	2.21%	-2.12%
			6345	6.024	33.928	5.887	34.686	2.33%	-2.19%
			6500	6.193	33.650	6.070	34.500	2.03%	-2.46%
			6505	6.199	33.644	6.076	34.494	2.02%	-2.46%
			6545	6.260	33.469	6.122	34.446	2.25%	-2.84%
			6675	6.445	33.298	6.273	34.290	2.74%	-2.89%
			6715	6.460	33.205	6.319	34.242	2.23%	-3.03%
			6785	6.549	33.193	6.400	34.158	2.33%	-2.83%
			7025	6.756	32.468	6.680	33.870	1.14%	-4.14%
04/20/2022	6500 Head	20.6	5935	5.567	34.678	5.411	35.143	2.88%	-1.32%
			5970	5.598	34.448	5.448	35.120	2.75%	-1.91%
			5985	5.645	34.417	5.464	35.110	3.31%	-1.97%
			6065	5.691	34.233	5.557	35.022	2.41%	-2.25%
			6075	5.708	34.184	5.569	35.010	2.50%	-2.36%
			6085	5.728	34.147	5.580	34.998	2.65%	-2.43%
			6275	5.976	33.832	5.805	34.770	2.95%	-2.70%
			6305	6.008	33.805	5.840	34.734	2.88%	-2.67%
			6345	6.056	33.737	5.887	34.686	2.87%	-2.74%
			6500	6.228	33.424	6.070	34.500	2.60%	-3.12%
			6545	6.301	33.241	6.122	34.446	2.92%	-3.50%
			6675	6.484	33.082	6.273	34.290	3.36%	-3.52%
			6715	6.505	32.982	6.319	34.242	2.94%	-3.68%
			6785	6.589	32.959	6.400	34.158	2.95%	-3.51%
			6825	6.591	32.816	6.447	34.110	2.23%	-3.79%
			7025	6.800	32.244	6.680	33.870	1.80%	-4.80%
05/04/2022	6500 Head	21.5	5935	5.468	34.509	5.411	35.143	1.05%	-1.80%
			5970	5.516	34.406	5.448	35.120	1.25%	-2.03%
			5985	5.536	34.377	5.464	35.110	1.32%	-2.09%
			6025	5.564	34.323	5.510	35.070	0.98%	-2.13%
			6065	5.625	34.245	5.557	35.022	1.22%	-2.22%
			6075	5.646	34.200	5.569	35.010	1.38%	-2.31%
			6085	5.661	34.172	5.580	34.998	1.45%	-2.36%
			6275	5.901	33.819	5.805	34.770	1.65%	-2.74%
			6305	5.917	33.796	5.840	34.734	1.32%	-2.70%
			6345	5.981	33.733	5.887	34.686	1.60%	-2.75%
			6500	6.150	33.486	6.070	34.500	1.32%	-2.94%
			6505	6.158	33.485	6.076	34.494	1.35%	-2.93%
			6545	6.223	33.334	6.122	34.446	1.65%	-3.23%
			6675	6.391	33.131	6.273	34.290	1.88%	-3.38%
			6715	6.428	33.007	6.319	34.242	1.72%	-3.61%
			6785	6.506	32.999	6.400	34.158	1.66%	-3.39%
			6825	6.530	32.894	6.447	34.110	1.29%	-3.56%
			6985	6.744	32.535	6.633	33.918	1.67%	-4.08%
			7025	6.751	32.438	6.680	33.870	1.06%	-4.23%
7/21/2022	6500 Head	19.8	6000	5.649	35.020	5.480	35.100	3.08%	-0.23%
			6025	5.682	34.966	5.510	35.070	3.12%	-0.30%
			6065	5.740	34.892	5.557	35.022	3.29%	-0.37%
			6075	5.753	34.868	5.569	35.010	3.30%	-0.41%
			6085	5.769	34.848	5.580	34.998	3.39%	-0.43%
			6275	6.013	34.498	5.805	34.770	3.58%	-0.78%
			6285	6.019	34.482	5.816	34.758	3.49%	-0.79%
			6305	6.038	34.480	5.840	34.734	3.39%	-0.73%
			6345	6.100	34.419	5.887	34.686	3.62%	-0.77%
			6475	6.264	34.132	6.041	34.530	3.69%	-1.15%
			6485	6.267	34.131	6.052	34.518	3.55%	-1.12%
			6500	6.282	34.197	6.070	34.500	3.49%	-0.88%
			6505	6.292	34.197	6.076	34.494	3.55%	-0.86%
			6545	6.363	34.031	6.122	34.446	3.94%	-1.20%
			6675	6.520	33.815	6.273	34.290	3.94%	-1.39%
			6685	6.528	33.811	6.285	34.278	3.87%	-1.36%
			6785	6.650	33.645	6.400	34.158	3.91%	-1.50%

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

Table 8-2
System Verification Results

System Verification TARGET & MEASURED																
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Source SN	Probe SN	Measured SAR_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	$Deviation_{1g}$ (%)	Measured $4cm^2$ APD (W/m^2)	1W Target $4cm^2$ APD (W/m^2)	1 W Normalized $4cm^2$ APD (W/m^2)	Deviation $4cm^2$ APD (%)
M	6500	Head	04/13/2022	23.5	23.5	0.050	1018	7551	14.300	290.000	286.000	-1.38%	64.5000	1310.0000	1290.000	-1.53%
M	6500	Head	04/18/2022	21.5	20.6	0.050	1018	7551	14.000	290.000	280.000	-3.45%	63.0000	1310.0000	1260.000	-3.82%
M	6500	Head	04/20/2022	22.3	20.6	0.025	1018	7551	7.150	290.000	286.000	-1.38%	32.4000	1310.0000	1296.000	-1.07%
M	6500	Head	05/04/2022	20.9	21.5	0.025	1018	7551	7.260	290.000	290.400	0.14%	33.0000	1310.0000	1320.000	0.76%
M	6500	Head	07/21/2022	21.6	20.0	0.025	1018	7551	6.980	290.000	279.200	-3.72%	31.4000	1310.0000	1256.000	-4.12%

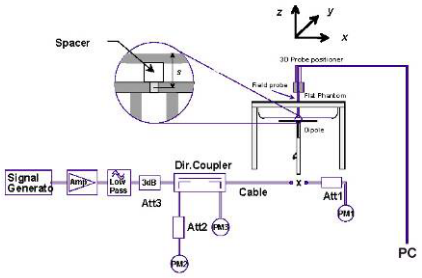

Figure 8-1
System Verification Setup Diagram

Figure 8-2
System Verification Setup Photo

8.2 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.

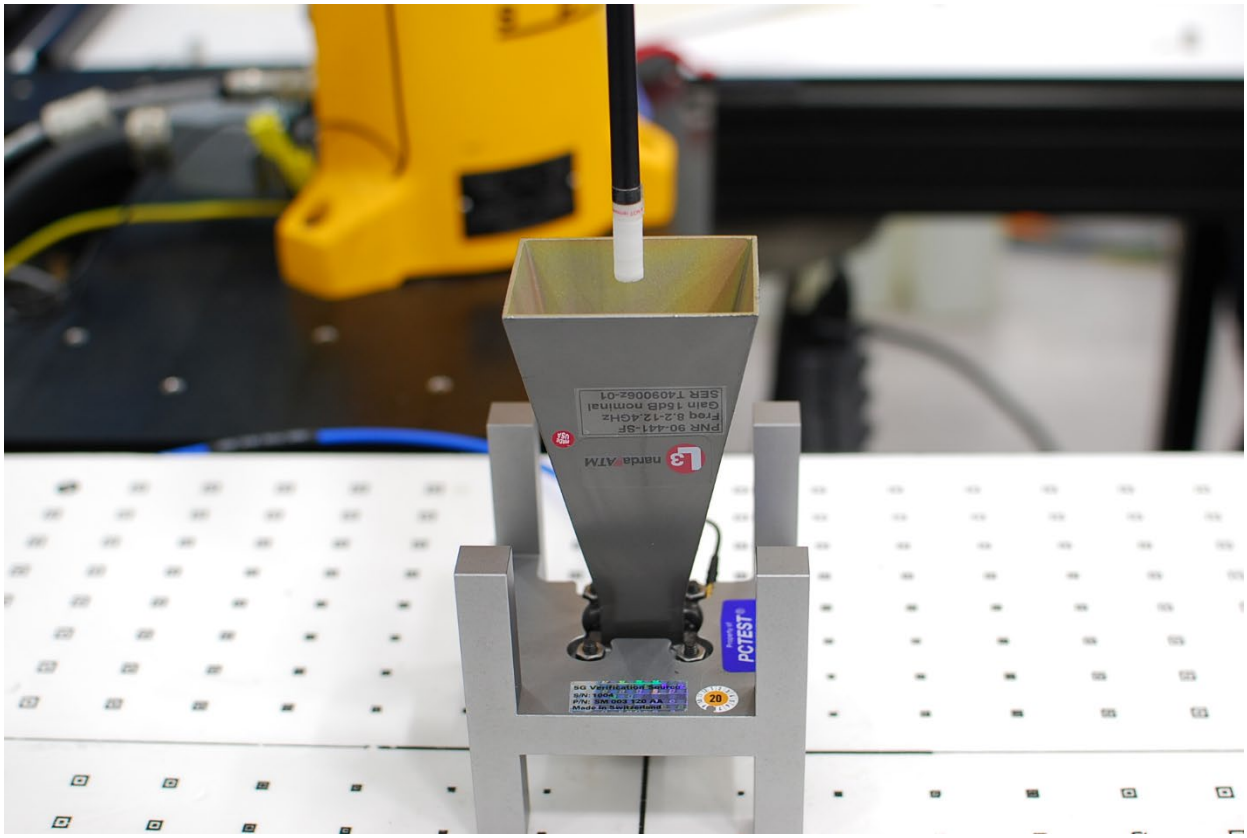

Figure 8-3
System Verification Setup Photo

Table 8-3
10 GHz Verifications

System Verification											
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	04/06/2022	1004	9389	86.1	50.00	50.70	-0.06	50.30	50.70	-0.03
Q	10	04/08/2022	1004	9389	86.1	48.00	50.70	-0.24	48.20	50.70	-0.22
Q	10	05/02/2022	1004	9389	86.1	51.20	50.70	0.04	51.50	50.70	0.07
Q	10	05/03/2022	1004	9364	86.1	50.10	50.70	-0.05	50.40	50.70	-0.03

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

9 DATA SUMMARY

9.1 SAR and Absorbed Power Density Results

Table 9-1
6 GHz WLAN Body SISO SAR – Tablet

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing (mm)	Antenna Config.	Accessory	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.														(W/kg)			(W/kg)	
6545.00	119	802.11ax	OFDM	80	8.5	8.02	0.00	0	1	N/A	0F013H3220700E	34.0	Back	99.3	0.074	1.117	1.007	0.083	
6545.00	119	802.11ax	OFDM	80	8.5	8.02	0.00	0	1	N/A	0F013H3220700E	34.0	Front	99.3	0.207	1.117	1.007	0.233	
6545.00	119	802.11ax	OFDM	80	8.5	8.02	0.00	0	1	N/A	0F013H3220700E	34.0	Right	99.3	0.000	1.117	1.007	0.000	
6065.00	23	802.11ax	OFDM	80	8.5	7.96	-0.04	0	1	N/A	0F013H3220700E	34.0	Left	99.3	0.704	1.132	1.007	0.803	
6305.00	71	802.11ax	OFDM	80	8.5	7.98	-0.06	0	1	N/A	0F013H3220700E	34.0	Left	99.3	0.921	1.127	1.007	1.045	
6545.00	119	802.11ax	OFDM	80	8.5	8.02	-0.02	0	1	N/A	0F013H3220700E	34.0	Left	99.3	0.814	1.117	1.007	0.916	
6785.00	167	802.11ax	OFDM	80	8.5	7.94	-0.05	0	1	N/A	0F013H3220700E	34.0	Left	99.3	0.997	1.138	1.007	1.143	A1
6785.00	167	802.11ax	OFDM	80	8.5	7.94	-0.02	0	1	Keyboard	0F013H3220700E	34.0	Left	99.3	0.611	1.138	1.007	0.700	
7025.00	215	802.11ax	OFDM	80	8.5	7.97	-0.15	0	1	N/A	0F013H3220700E	34.0	Left	99.3	0.793	1.130	1.007	0.902	
6785.00	167	802.11ax	OFDM	80	8.5	7.92	0.16	0	2	N/A	0F013H3220700E	34.0	Back	99.3	0.079	1.143	1.007	0.091	
6785.00	167	802.11ax	OFDM	80	8.5	7.92	0.12	0	2	N/A	0F013H3220700E	34.0	Front	99.3	0.361	1.143	1.007	0.416	
6065.00	23	802.11ax	OFDM	80	8.5	7.81	-0.03	0	2	N/A	0F013H3220700E	34.0	Right	99.3	0.621	1.172	1.007	0.733	
6305.00	71	802.11ax	OFDM	80	8.5	7.41	-0.10	0	2	N/A	0F013H3220700E	34.0	Right	99.3	0.583	1.285	1.007	0.754	
6545.00	119	802.11ax	OFDM	80	8.5	7.71	-0.01	0	2	N/A	0F013H3220700E	34.0	Right	99.3	0.627	1.199	1.007	0.757	
6785.00	167	802.11ax	OFDM	80	8.5	7.92	-0.06	0	2	N/A	0F013H3220700E	34.0	Right	99.3	0.709	1.143	1.007	0.816	
7025.00	215	802.11ax	OFDM	80	8.0	6.92	-0.09	0	2	N/A	0F013H3220700E	34.0	Right	99.3	0.772	1.282	1.007	0.997	
7025.00	215	802.11ax	OFDM	80	8.0	6.92	0.05	0	2	Keyboard	0F013H3220700E	34.0	Right	99.3	0.700	1.282	1.007	0.904	
6785.00	167	802.11ax	OFDM	80	8.5	7.92	0.00	0	2	N/A	0F013H3220700E	34.0	Left	99.3	0.000	1.143	1.007	0.000	
6305.00	71	802.11ax	OFDM	80	3.0	2.10	0.15	0	1	N/A	0F013H3220700E	34.0	Back	99.3	0.025	1.230	1.007	0.031	
6305.00	71	802.11ax	OFDM	80	3.0	2.10	-0.20	0	1	N/A	0F013H3220700E	34.0	Front	99.3	0.062	1.230	1.007	0.077	
6305.00	71	802.11ax	OFDM	80	3.0	2.10	-0.03	0	1	N/A	0F013H3220700E	34.0	Left	99.3	0.157	1.230	1.007	0.194	
6065.00	23	802.11ax	OFDM	80	3.0	2.01	0.03	0	1	N/A	0F013H3220700E	34.0	Left	99.3	0.102	1.256	1.007	0.129	
6545.00	119	802.11ax	OFDM	80	3.0	1.62	0.15	0	1	N/A	0F013H3220700E	34.0	Left	99.3	0.111	1.374	1.007	0.154	
6785.00	167	802.11ax	OFDM	80	3.0	1.47	-0.11	0	1	N/A	0F013H3220700E	34.0	Left	99.3	0.159	1.422	1.007	0.228	
7025.00	215	802.11ax	OFDM	80	3.0	1.66	-0.13	0	1	N/A	0F013H3220700E	34.0	Left	99.3	0.135	1.361	1.007	0.185	
6545.00	119	802.11ax	OFDM	80	5.0	3.48	-0.19	0	2	N/A	0F013H3220700E	34.0	Back	99.3	0.024	1.419	1.007	0.034	
6545.00	119	802.11ax	OFDM	80	5.0	3.48	-0.12	0	2	N/A	0F013H3220700E	34.0	Front	99.3	0.096	1.419	1.007	0.137	
6545.00	119	802.11ax	OFDM	80	5.0	3.48	-0.14	0	2	N/A	0F013H3220700E	34.0	Right	99.3	0.197	1.419	1.007	0.281	
6065.00	23	802.11ax	OFDM	80	5.0	3.40	0.20	0	2	N/A	0F013H3220700E	34.0	Right	99.3	0.188	1.445	1.007	0.274	
6305.00	71	802.11ax	OFDM	80	5.0	3.18	-0.14	0	2	N/A	0F013H3220700E	34.0	Right	99.3	0.213	1.521	1.007	0.326	
6785.00	167	802.11ax	OFDM	80	5.0	3.30	-0.12	0	2	N/A	0F013H3220700E	34.0	Right	99.3	0.225	1.479	1.007	0.335	
7025.00	215	802.11ax	OFDM	80	4.0	2.54	-0.04	0	2	N/A	0F013H3220700E	34.0	Right	99.3	0.283	1.400	1.007	0.399	
6785.00	167	802.11ax	OFDM	80	8.5	7.94	0.00	0	1	N/A	0F013H3220700E	34.0	Left	99.3	0.918	1.138	1.007	1.052	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram						

Note: Blue entry represents variability measurement

Table 9-2
6 GHz WLAN Body SISO SAR - Laptop

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing (mm)	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													(W/kg)			(W/kg)	
6025.00	15	802.11ax	OFDM	160	16.0	15.12	-0.17	0	1	0F013H3220700E	68.1	Bottom	99.3	0.095	1.225	1.007	0.117	A2
6345.00	79	802.11ax	OFDM	160	16.0	15.19	0.11	0	1	0F013H3220700E	68.1	Bottom	99.3	0.073	1.205	1.007	0.089	
6505.00	111	802.11ax	OFDM	160	16.0	15.43	0.05	0	1	0F013H3220700E	68.1	Bottom	99.3	0.075	1.140	1.007	0.086	
6825.00	175	802.11ax	OFDM	160	16.0	15.47	-0.03	0	1	0F013H3220700E	68.1	Bottom	99.3	0.033	1.130	1.007	0.038	
6985.00	207	802.11ax	OFDM	160	16.0	15.19	-0.16	0	1	0F013H3220700E	68.1	Bottom	99.3	0.044	1.205	1.007	0.053	
6025.00	15	802.11ax	OFDM	160	16.0	15.66	0.18	0	2	0F013H3220700E	68.1	Bottom	99.3	0.026	1.081	1.007	0.028	
6345.00	79	802.11ax	OFDM	160	16.0	15.34	0.04	0	2	0F013H3220700E	68.1	Bottom	99.3	0.019	1.164	1.007	0.022	
6505.00	111	802.11ax	OFDM	160	16.0	15.51	-0.16	0	2	0F013H3220700E	68.1	Bottom	99.3	0.024	1.119	1.007	0.027	
6825.00	175	802.11ax	OFDM	160	16.0	15.48	-0.13	0	2	0F013H3220700E	68.1	Bottom	99.3	0.026	1.127	1.007	0.037	
6985.00	207	802.11ax	OFDM	160	16.0	15.64	-0.02	0	2	0F013H3220700E	68.1	Bottom	99.3	0.043	1.086	1.007	0.047	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram										

Table 9-3
6 GHz WLAN Body SISO Absorbed Power Density - Tablet

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing (mm)	Antenna Config.	Accessory	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Measured APD	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported APD	Plot #
MHz	Ch.														W/m² (4cm²)			W/m² (4cm²)	
6545.00	119	802.11ax	OFDM	80	8.5	8.02	0.00	0.0	1	N/A	0F013H3220700E	34.0	Back	99.3	0.427	1.117	1.007	0.480	
6545.00	119	802.11ax	OFDM	80	8.5	8.02	0.00	0.0	1	N/A	0F013H3220700E	34.0	Front	99.3	1.180	1.117	1.007	1.327	
6545.00	119	802.11ax	OFDM	80	8.5	8.02	0.00	0.0	1	N/A	0F013H3220700E	34.0	Right	99.3	0.009	1.117	1.007	0.010	
6065.00	23	802.11ax	OFDM	80	8.5	7.96	-0.04	0.0	1	N/A	0F013H3220700E	34.0	Left	99.3	3.690	1.132	1.007	4.206	
6305.00	71	802.11ax	OFDM	80	8.5	7.98	-0.06	0.0	1	N/A	0F013H3220700E	34.0	Left	99.3	4.770	1.127	1.007	5.413	
6545.00	119	802.11ax	OFDM	80	8.5	8.02	-0.02	0.0	1	N/A	0F013H3220700E	34.0	Left	99.3	4.180	1.117	1.007	4.702	
6785.00	167	802.11ax	OFDM	80	8.5	7.94	-0.05	0.0	1	N/A	0F013H3220700E	34.0	Left	99.3	5.030	1.138	1.007	5.764	A1
6785.00	167	802.11ax	OFDM	80	8.5	7.94	-0.02	0.0	1	Keyboard	0F013H3220700E	34.0	Left	99.3	3.330	1.138	1.007	3.816	
7025.00	215	802.11ax	OFDM	80	8.5	7.97	-0.15	0.0	1	N/A	0F013H3220700E	34.0	Left	99.3	3.970	1.130	1.007	4.518	
6785.00	167	802.11ax	OFDM	80	8.5	7.92	0.16	0.0	2	N/A	0F013H3220700E	34.0	Back	99.3	0.484	1.143	1.007	0.557	
6785.00	167	802.11ax	OFDM	80	8.5	7.92	0.12	0.0	2	N/A	0F013H3220700E	34.0	Front	99.3	2.110	1.143	1.007	2.429	
6065.00	23	802.11ax	OFDM	80	8.5	7.81	-0.03	0.0	2	N/A	0F013H3220700E	34.0	Right	99.3	3.420	1.172	1.007	4.036	
6305.00	71	802.11ax	OFDM	80	8.5	7.41	-0.10	0.0	2	N/A	0F013H3220700E	34.0	Right	99.3	2.990	1.285	1.007	3.869	
6545.00	119	802.11ax	OFDM	80	8.5	7.71	-0.01	0.0	2	N/A	0F013H3220700E	34.0	Right	99.3	3.200	1.199	1.007	3.864	
6785.00	167	802.11ax	OFDM	80	8.5	7.92	-0.06	0.0	2	N/A	0F013H3220700E	34.0	Right	99.3	3.410	1.143	1.007	3.925	
7025.00	215	802.11ax	OFDM	80	8.0	6.92	-0.09	0.0	2	N/A	0F013H3220700E	34.0	Right	99.3	3.840	1.282	1.007	4.957	
7025.00	215	802.11ax	OFDM	80	8.0	6.92	0.05	0.0	2	Keyboard	0F013H3220700E	34.0	Right	99.3	3.450	1.282	1.007	4.454	
6785.00	167	802.11ax	OFDM	80	8.5	7.92	0.00	0.0	2	N/A	0F013H3220700E	34.0	Left	99.3	0.000	1.143	1.007	0.000	
6305.00	71	802.11ax	OFDM	80	3.0	2.10	0.15	0.0	1	N/A	0F013H3220700E	34.0	Back	99.3	0.130	1.230	1.007	0.161	
6305.00	71	802.11ax	OFDM	80	3.0	2.10	-0.20	0.0	1	N/A	0F013H3220700E	34.0	Front	99.3	0.332	1.230	1.007	0.411	
6305.00	71	802.11ax	OFDM	80	3.0	2.10	-0.03	0.0	1	N/A	0F013H3220700E	34.0	Left	99.3	0.798	1.230	1.007	0.988	
6065.00	23	802.11ax	OFDM	80	3.0	2.01	0.03	0.0	1	N/A	0F013H3220700E	34.0	Left	99.3	0.551	1.256	1.007	0.697	
6545.00	119	802.11ax	OFDM	80	3.0	1.62	0.15	0.0	1	N/A	0F013H3220700E	34.0	Left	99.3	0.551	1.374	1.007	0.762	
6785.00	167	802.11ax	OFDM	80	3.0	1.47	-0.11	0.0	1	N/A	0F013H3220700E	34.0	Left	99.3	0.731	1.422	1.007	1.047	
7025.00	215	802.11ax	OFDM	80	3.0	1.66	-0.13	0.0	1	N/A	0F013H3220700E	34.0	Left	99.3	0.622	1.361	1.007	0.852	
6545.00	119	802.11ax	OFDM	80	5.0	3.48	-0.19	0.0	2	N/A	0F013H3220700E	34.0	Back	99.3	0.137	1.419	1.007	0.196	
6545.00	119	802.11ax	OFDM	80	5.0	3.48	-0.12	0.0	2	N/A	0F013H3220700E	34.0	Front	99.3	0.616	1.419	1.007	0.880	
6545.00	119	802.11ax	OFDM	80	5.0	3.48	-0.14	0.0	2	N/A	0F013H3220700E	34.0	Right	99.3	0.947	1.419	1.007	1.353	
6065.00	23	802.11ax	OFDM	80	5.0	3.40	0.20	0.0	2	N/A	0F013H3220700E	34.0	Right	99.3	1.020	1.445	1.007	1.484	
6305.00	71	802.11ax	OFDM	80	5.0	3.18	-0.14	0.0	2	N/A	0F013H3220700E	34.0	Right	99.3	1.060	1.521	1.007	1.624	
6785.00	167	802.11ax	OFDM	80	5.0	3.30	-0.12	0.0	2	N/A	0F013H3220700E	34.0	Right	99.3	1.080	1.479	1.007	1.609	
7025.00	215	802.11ax	OFDM	80	4.0	2.54	-0.04	0.0	2	N/A	0F013H3220700E	34.0	Right	99.3	1.350	1.400	1.007	1.903	
6785.00	167	802.11ax	OFDM	80	8.5	7.94	0.00	0.0	1	N/A	0F013H3220700E	34.0	Left	99.3	4.670	1.138	1.007	5.352	

Note: Blue entry represents variability measurement

Table 9-4
6 GHz WLAN Body SISO Absorbed Power Density - Laptop

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Power Drift [dB]	Spacing (mm)	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Measured APD	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													W/m² (4cm²)			W/m² (4cm²)	
6025.00	15	802.11ax	OFDM	160	16.0	15.12	-0.17	0.0	1.0	0F013H3220700E	68.1	Bottom	99.3	0.723	1.225	1.007	0.892	A2
6345.00	79	802.11ax	OFDM	160	16.0	15.19	0.11	0.0	1.0	0F013H3220700E	68.1	Bottom	99.3	0.543	1.205	1.007	0.659	
6505.00	111	802.11ax	OFDM	160	16.0	15.43	0.05	0.0	1.0	0F013H3220700E	68.1	Bottom	99.3	0.540	1.140	1.007	0.620	
6825.00	175	802.11ax	OFDM	160	16.0	15.47	-0.03	0.0	1.0	0F013H3220700E	68.1	Bottom	99.3	0.267	1.130	1.007	0.304	
6985.00	207	802.11ax	OFDM	160	16.0	15.19	-0.16	0.0	1.0	0F013H3220700E	68.1	Bottom	99.3	0.394	1.205	1.007	0.478	
6025.00	15	802.11ax	OFDM	160	16.0	15.66	0.18	0.0	2.0	0F013H3220700E	68.1	Bottom	99.3	0.238	1.081	1.007	0.259	
6345.00	79	802.11ax	OFDM	160	16.0	15.34	0.04	0.0	2.0	0F013H3220700E	68.1	Bottom	99.3	0.172	1.164	1.007	0.202	
6505.00	111	802.11ax	OFDM	160	16.0	15.51	-0.16	0.0	2.0	0F013H3220700E	68.1	Bottom	99.3	0.187	1.119	1.007	0.211	
6825.00	175	802.11ax	OFDM	160	16.0	15.48	-0.13	0.0	2.0	0F013H3220700E	68.1	Bottom	99.3	0.219	1.127	1.007	0.249	
6985.00	207	802.11ax	OFDM	160	16.0	15.64	-0.02	0.0	2.0	0F013H3220700E	68.1	Bottom	99.3	0.352	1.086	1.007	0.385	

SAR and Absorbed Power Density General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D04.
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 and APD results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D04.
6. Per FCC guidance, SAR was performed using 6.5 GHz SAR probe calibration factors. Per October 2020 TCB Workshop notes, 5 channels were tested. Absorbed power density (APD) using a 4cm2 averaging area is reported based on SAR measurements.
7. Per FCC KDB 865664 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were greater than or equal to 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 10 for variability analysis.
8. Per FCC KDB 616217 D04, SAR is evaluated for the bottom surface of a keyboard when it is attached to the DUT in laptop configuration.
9. Per FCC KDB 648474 D04, highest reported SAR tablet configuration for a transmission band on an antenna was additionally evaluated with keyboard accessory attached and folded back at 360°.

WLAN Notes:

10. 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.
11. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance. Procedures used to measure the duty factor are identical to that in the associated EMC test reports.

9.2 Power Density Results

Table 9-5
6 GHz WLAN SISO Power Density - Tablet

MEASUREMENT RESULTS																							
Frequency (MHz)	Channel	Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift (dB)	Spacing (mm)	Antenna Config.	Accessory	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)	Plot #
6545.00	119	802.11ax	OFDM	80	8.5	8.02	0.06	2	1	N/A	0F013H3220700E	34	Back	99.3	0.125	-	1.554	1.117	1.007	0.514	0.898	0.548	0.958	
6545.00	119	802.11ax	OFDM	80	8.5	8.02	0.20	2	1	N/A	0F013H3220700E	34	Front	99.3	0.125	-	1.554	1.117	1.007	1.130	1.975	1.490	2.604	
6065.00	23	802.11ax	OFDM	80	8.5	7.96	-0.10	2	1	N/A	0F013H3220700E	34	Left	99.3	0.125	-	1.554	1.132	1.007	0.485	0.859	0.645	1.143	
6305.00	71	802.11ax	OFDM	80	8.5	7.98	0.00	2	1	N/A	0F013H3220700E	34	Left	99.3	0.125	-	1.554	1.127	1.007	1.470	2.593	1.790	3.157	
6545.00	119	802.11ax	OFDM	80	8.5	8.02	-0.07	2	1	N/A	0F013H3220700E	34	Left	99.3	0.125	0.56	1.554	1.117	1.007	1.250	2.185	1.510	2.639	
6545.00	119	802.11ax	OFDM	80	8.5	8.02	0.17	9.16	1	N/A	0F013H3220700E	34	Left	99.3	0.125	0.64	1.554	1.117	1.007	0.619	1.082	0.697	1.218	
6785.00	167	802.11ax	OFDM	80	8.5	7.94	-0.03	2	1	N/A	0F013H3220700E	34	Left	99.3	0.125	-	1.554	1.138	1.007	1.510	2.689	2.140	3.811	
6785.00	167	802.11ax	OFDM	80	8.5	7.94	-0.03	2	1	Keyboard	0F013H3220700E	34	Left	99.3	0.125	-	1.554	1.138	1.007	0.581	1.035	0.760	1.353	
7025.00	215	802.11ax	OFDM	80	8.5	7.97	-0.20	2	1	N/A	0F013H3220700E	34	Left	99.3	0.125	-	1.554	1.130	1.007	1.440	2.546	1.860	3.289	
6785.00	167	802.11ax	OFDM	80	8.5	7.92	0.20	2	2	N/A	0F013H3220700E	34	Back	99.3	0.125	-	1.554	1.143	1.007	0.195	0.349	0.253	0.453	
6785.00	167	802.11ax	OFDM	80	8.5	7.92	-0.03	2	2	N/A	0F013H3220700E	34	Front	99.3	0.125	-	1.554	1.143	1.007	0.679	1.214	0.907	1.622	
6065.00	23	802.11ax	OFDM	80	8.5	7.81	0.03	2	2	N/A	0F013H3220700E	34	Right	99.3	0.125	-	1.554	1.172	1.007	0.884	1.621	1.170	2.146	
6305.00	71	802.11ax	OFDM	80	8.5	7.41	-0.20	2	2	N/A	0F013H3220700E	34	Right	99.3	0.125	-	1.554	1.285	1.007	0.504	1.013	0.607	1.221	
6545.00	119	802.11ax	OFDM	80	8.5	7.71	-0.10	2	2	N/A	0F013H3220700E	34	Right	99.3	0.125	-	1.554	1.199	1.007	0.941	1.766	1.110	2.083	
6785.00	167	802.11ax	OFDM	80	8.5	7.92	-0.08	2	2	N/A	0F013H3220700E	34	Right	99.3	0.125	-	1.554	1.143	1.007	2.600	4.651	2.920	5.223	A3
6785.00	167	802.11ax	OFDM	80	8.5	7.92	0.04	2	2	Keyboard	0F013H3220700E	34	Right	99.3	0.125	-	1.554	1.143	1.007	0.883	1.579	1.030	1.842	
7025.00	215	802.11ax	OFDM	80	8.0	6.92	-0.18	2	2	N/A	0F013H3220700E	34	Right	99.3	0.125	-	1.554	1.282	1.007	1.180	2.367	1.450	2.909	
47 CFR §1.1310 - SAFETY LIMIT Spatial Average Uncontrolled Exposure / General Population												Power Density 10 W/m² averaged over 4 cm²												

Table 9-6
6 GHz WLAN SISO Power Density - Laptop

MEASUREMENT RESULTS																						
Frequency (MHz)	Channel	Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift (dB)	Spacing (mm)	Antenna Config.	DUT Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Grid Step (λ)	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)	Plot #
6025.00	15	802.11ax	OFDM	160	16.0	15.12	-0.04	2	1	0F013H3220700E	68.1	Bottom	99.3	0.125	1.554	1.225	1.007	0.531	1.018	0.558	1.070	A4
6345.00	79	802.11ax	OFDM	160	16.0	15.19	-0.20	2	1	0F013H3220700E	68.1	Bottom	99.3	0.125	1.554	1.205	1.007	0.219	0.413	0.296	0.558	
6505.00	111	802.11ax	OFDM	160	16.0	15.43	-0.07	2	1	0F013H3220700E	68.1	Bottom	99.3	0.125	1.554	1.140	1.007	0.199	0.355	0.249	0.444	
6825.00	175	802.11ax	OFDM	160	16.0	15.47	0.15	2	1	0F013H3220700E	68.1	Bottom	99.3	0.125	1.554	1.130	1.007	0.134	0.237	0.176	0.311	
6985.00	207	802.11ax	OFDM	160	16.0	15.19	-0.08	2	1	0F013H3220700E	68.1	Bottom	99.3	0.125	1.554	1.205	1.007	0.147	0.277	0.184	0.347	
6025.00	15	802.11ax	OFDM	160	16.0	15.66	-0.07	2	2	0F013H3220700E	68.1	Bottom	99.3	0.125	1.554	1.081	1.007	0.130	0.220	0.181	0.306	
6345.00	79	802.11ax	OFDM	160	16.0	15.34	-0.06	2	2	0F013H3220700E	68.1	Bottom	99.3	0.125	1.554	1.164	1.007	0.137	0.250	0.214	0.390	
6505.00	111	802.11ax	OFDM	160	16.0	15.51	0.09	2	2	0F013H3220700E	68.1	Bottom	99.3	0.125	1.554	1.119	1.007	0.124	0.217	0.143	0.250	
6825.00	175	802.11ax	OFDM	160	16.0	15.48	-0.20	2	2	0F013H3220700E	68.1	Bottom	99.3	0.125	1.554	1.127	1.007	0.165	0.291	0.171	0.302	
6985.00	207	802.11ax	OFDM	160	16.0	15.64	-0.14	2	2	0F013H3220700E	68.1	Bottom	99.3	0.125	1.554	1.086	1.007	0.323	0.549	0.343	0.583	
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. PD results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D04.
8. PTP-PR algorithm was used during psPD measurement and calculations.

10 SAR MEASUREMENT VARIABILITY

10.1 Measurement Variability

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

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

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

Table 10-1
Body SAR Measurement Variability Results - Tablet

BODY VARIABILITY RESULTS															
FREQUENCY		Mode	Service	Bandwidth [MHz]	Data Rate (Mbps)	Spacing [mm]	Antenna Config	Side	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	Ratio	3rd Repeated SAR (1g)	Ratio
MHz	Ch.								(W/kg)	(W/kg)		(W/kg)		(W/kg)	
6785.00	167	802.11ax	OFDM	80	34	0	1	Left	0.997	0.918	1.09	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Body 1.6 W/kg (mW/g) averaged over 1 gram									

10.2 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 IEEE 1528-2013 was not required.

11 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	WL25-1	Conducted Cable Set (25GHz)	12/19/2021	Annual	12/19/2022	WL25-1
Agilent	N9038A	MXE EMI Receiver	N/A	N/A	N/A	MY51210133
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	N/A	N/A	N/A	103200
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	N/A	N/A	N/A	A051107
Emco	3115	Horn Antenna (1-18GHz)	N/A	N/A	N/A	9704-5182
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433975
Keysight Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	7/21/2021	Annual	7/21/2022	MY49430494
SPEAG	EUmmWV3	EUmmWV3 Probe	11/11/2021	Annual	11/11/2022	9389
SPEAG	EUmmWV3	EUmmWV3 Probe	6/21/2021	Annual	6/21/2022	9364
SPEAG	SM 003 100 AA	10 GHz System Verification Antenna	8/12/2021	Annual	8/12/2022	1004
SPEAG	DAE4ip	Dasy Data Acquisition Electronics	11/11/2021	Annual	11/11/2022	1638
SPEAG	EX3DV4	SAR Probe	10/26/2021	Annual	10/26/2022	7551
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/15/2021	Annual	9/15/2022	1449
SPEAG	D6.5GHzV2	6.5GHz SAR Dipole	12/13/2021	Annual	12/13/2022	1018
Control Company	4352	Long Stem Thermometer	5/16/2020	Biennial	5/16/2022	200294604
Control Company	4040	Therm./Clock/Humidity Monitor	3/12/2021	Biennial	3/12/2023	210202100
Agilent	SMF100A	Signal Generator	5/7/2020	Biennial	5/7/2022	101590
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/12/2021	Annual	5/12/2022	1070
Mitutoyo	500-196-30	CD-6"ASX 6Inch Digital Caliper	2/16/2022	Triennial	2/16/2025	A20238413
Anritsu	MS2038C	20 GHz Vector Network Analyzer	2/18/2022	Annual	2/18/2023	1214109
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
MiniCircuits	ZUDC10-83-S+	Directional Coupler	9/15/2021	Annual	9/15/2022	2111
Seekonk	NC-100	Torque Wrench	8/5/2020	Biennial	8/5/2022	N/A
Anritsu	MA2411B	Pulse Power Sensor	8/10/2021	Annual	8/10/2022	1207364
Anritsu	MA2411B	Pulse Power Sensor	9/21/2021	Annual	9/21/2022	1339008
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1520

Note:

1. Each equipment item 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.

12 MEASUREMENT UNCERTAINTIES

Applicable for SAR measurements:

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	IEEE 1528 Sec.	Tol. (± %)	Prob. Dist.	Div.	c_i 1gm	c_i 10 gms	1gm u_i (± %)	10gms u_i (± %)	v_i
Measurement System									
Probe Calibration	E.2.1	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	1.732	1	1	1.2	1.2	∞
Linearity	E.2.4	0.3	N	1	1	1	0.3	0.3	∞
System Detection Limits	E.2.4	0.25	R	1.732	1	1	0.1	0.1	∞
Modulation Response	E.2.5	4.8	R	1.732	1	1	2.8	2.8	∞
Readout Electronics	E.2.6	0.3	N	1	1	1	0.3	0.3	∞
Response Time	E.2.7	0.8	R	1.732	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.732	1	1	1.5	1.5	∞
RF Ambient Conditions - Noise	E.6.1	3	R	1.732	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	3	R	1.732	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.8	R	1.732	1	1	0.5	0.5	∞
Probe Positioning w/ respect to Phantom	E.6.3	6.7	R	1.732	1	1	3.9	3.9	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	4	R	1.732	1	1	2.3	2.3	∞
Test Sample Related									
Test Sample Positioning	E.4.2	3.12	N	1	1	1	3.1	3.1	35
Device Holder Uncertainty	E.4.1	1.67	N	1	1	1	1.7	1.7	5
Output Power Variation - SAR drift measurement	E.2.9	5	R	1.732	1	1	2.9	2.9	∞
SAR Scaling	E.6.5	0	R	1.732	1	1	0.0	0.0	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	7.6	R	1.73	1.0	1.0	4.4	4.4	∞
Liquid Conductivity - measurement uncertainty	E.3.3	4.3	N	1	0.78	0.71	3.3	3.0	76
Liquid Permittivity - measurement uncertainty	E.3.3	4.2	N	1	0.23	0.26	1.0	1.1	75
Liquid Conductivity - Temperature Uncertainty	E.3.4	3.4	R	1.732	0.78	0.71	1.5	1.4	∞
Liquid Permittivity - Temperature Unceritainty	E.3.4	0.6	R	1.732	0.23	0.26	0.1	0.1	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Combined Standard Uncertainty (k=1)			RSS				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			2.68	

14 CONCLUSION

14.1 Measurement Conclusion

The SAR and power density measurements indicate that the DUT complies with the RF radiation exposure limits of the FCC, 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 RF Exposure 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.

15 REFERENCES

[1] 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.

[2] IEC TR 63170:2018, Measurement Procedure for the Evaluation of Power Density Related to Human Exposure to Radiofrequency Fields from Wireless Communication Devices Operating between 6 GHz and 100 GHz

[3] IEC TR 62630: 2010, Guidance for Evaluating Exposure from Multiple Electromagnetic Sources

[4] K. Pokovic, T. Schmid, J. Frohlich, and N. Kuster. Novel Probes and Evaluation Procedures to Assess Field Magnitude and Polarization. IEEE Transactions on Electromagnetic Compatibility 42(2): 240 -244, 2000

[5] R. W. Gerchberg and W. O. Saxton. A Practical Algorithm for the Determination of Phase from Image and Diffraction Plane Pictures. Optik 35(2): 237 – 246, 1972

[6] A. P. Anderson and S. Sali. New Possibilities for Phaseless Microwave Diagnostics. Part 1: Error Reduction Techniques. IEE Proceedings H – Microwaves, Antennas and Propagation 132(5): 290 – 298, 1985

[7] FCC KDB 865664 D02 v01r04: SAR Measurement Requirements for 100 MHz to 6 GHz. Federal Communications Commission – Office of Engineering and Technology, Laboratory Division.

[8] FCC KDB 447498 D01 v02r01: RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices. Federal Communications Commission – Office of Engineering and Technology, Laboratory Division.

[9] November 2017 Telecommunications Certification Body Council (TCBC) Workshop Notes

[10] October 2018 Telecommunications Certification Body Council (TCBC) Workshop Notes

[11] April 2019 Telecommunications Certification Body Council (TCBC) Workshop Notes

[12] November 2019 Telecommunications Certification Body Council (TCBC) Workshop Notes

[13] SPEAG DASY6 System Handbook (September 2019)

[14] SPEAG DASY6 Application Note (Interim Procedures for Devices Operating at 6-10 GHz)

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

[16] 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.

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

[18] 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.

[19] 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.

[20] 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.

[21] 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.

[22] 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.

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

[24] 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.

[25] 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.

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

[27] 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.

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

[29] 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.

[30] 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.

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

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

[33] 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.

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

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

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

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

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

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

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

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

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

[43] 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.

[44] 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.