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## WIFI 6 GHZ RF EXPOSURE EVALUATION

**Applicant Name**

Samsung Electronics Co., Ltd.  
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 Yeongtong-gu, Suwon-si  
 Gyeonggi-do, 16677, Korea

**Date of Testing**

10/12/2021 – 10/19/2021

**Test Site/Location**

PCTEST, Columbia, MD, USA

**Document Serial No:**

1M2109090103-28.A3L (Rev 1)

<b>FCC ID:</b>	<b>A3LSMS906U</b>
<b>APPLICANT:</b>	<b>SAMSUNG ELECTRONICS CO., LTD.</b>


**DUT Type:** Portable Handset  
**Application Type:** Certification  
**FCC Rule Part(s):** CFR §2.1093  
**Model:** SM-S906U  
**Additional Models:** SM-S906U1

Band & Mode	Tx Frequency	SAR			APD			PD
	MHz	1g Head (W/kg)	1g Body-worn (W/kg)	10g Phablet (W/kg)	Head (W/m <sup>2</sup> )	Body-worn (W/m <sup>2</sup> )	Phablet (W/m <sup>2</sup> )	psPD (W/m <sup>2</sup> )
WIFI 6 GHz	5935-7115	0.122	0.114	0.553	0.738	0.724	10.40	6.60

Values above represent RF exposure evaluations during MIMO operations.

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.

  
 Randy Ortanez  
 President



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**APPENDIX F: SAR SYSTEM VALIDATION**

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# 1 DEVICE UNDER TEST

## 1.1 Device Overview

Band & Mode	Tx Frequency
U-NII-5	5925 - 6425 MHz
U-NII-6	6425 - 6525 MHz
U-NII-7	6525 - 6875 MHz
U-NII-8	6875 - 7125 MHz

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## 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 D01v06.

### 1.2.1 Maximum MIMO WLAN Output Power



Mode	IEEE 802.11 (in dBm)			
	MIMO			
	a (CDD + STBC)		ax (SU) (CDD + STBC, SDM)	
	Nominal	Maximum	Nominal	Maximum
6 GHz WIFI (20MHz BW)	13.0	14.0	13.0	14.0
6 GHz WIFI (40MHz BW)			12.0	13.0
6 GHz WIFI (80MHz BW)			12.0	13.0
6 GHz WIFI (160MHz BW)			12.0	13.0

### 1.2.2 Reduced MIMO WLAN Output Power

The table below is applicable for the following conditions:

- Simultaneous conditions with 5G NR

Mode	IEEE 802.11 (in dBm)			
	MIMO			
	a (CDD + STBC)		ax (SU) (CDD + STBC, SDM)	
	Nominal	Maximum	Nominal	Maximum
6 GHz WIFI (20MHz BW)	11.0	12.0	11.0	12.0
6 GHz WIFI (40MHz BW)			11.0	12.0
6 GHz WIFI (80MHz BW)			11.0	12.0
6 GHz WIFI (160MHz BW)			11.0	12.0

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### 1.3 DUT Antenna Locations

The overall dimensions of this device are > 9 x 5 cm. A diagram showing the location of the device antennas can be found in SAR Part 1 Report Appendix F. Since the diagonal dimension of this device is > 160 mm and <200 mm, it is considered a “phablet.” Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC filing

**Table 1-1  
Device Surfaces**

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

Note: Particular DUT edges were not required to be evaluated for phablet SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v02r01 Section III and FCC KDB Publication 648474 D04v01r03. The distances between the transmit antennas and the edges of the device are included in the filing. Wireless router mode is disabled for all 6 GHz WLAN operations.

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## 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<sup>2</sup> 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%.

Per FCC KDB Publication 648474 D04v01r03, this device is considered a "phablet" since the diagonal dimension is greater than 160mm and less than 200mm. Therefore, phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.

6 GHz WIFI SAR results are used for simultaneous transmission analysis with the other transmitters and total exposure ratio (TER). Analysis can be found in SAR report and Near Field PD Report.

## 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) (Sept 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 D01 v06
- FCC KDB 865664 D01 v01r04

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## 2.1 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.

## 2.2 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.

## 2.3 RF Exposure Limits for Frequencies Below 6 GHz

**Table 2-1**  
**SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6**

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT <i>General Population</i> (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT <i>Occupational</i> (W/kg) or (mW/g)
<b>Peak Spatial Average SAR</b> Head	1.6	8.0
<b>Whole Body SAR</b>	0.08	0.4
<b>Peak Spatial Average SAR</b> 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.

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## 2.4 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<sup>2</sup> or mW/cm<sup>2</sup>.

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

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

Human Exposure to Radiofrequency (RF) Radiation Limits		
Frequency Range [MHz]	Power Density [mW/cm <sup>2</sup> ]	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<sup>2</sup> is 10 W/m<sup>2</sup>

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## 3

## RF CONDUCTED POWERS




Table 3-1  
6 GHz WLAN Maximum Average RF Power – 802.11a 20 MHz BW

6GHz (20MHz) 802.11a Conducted Power [dBm]				
Freq [MHz]	Channel	ANT1	ANT2	MIMO
5955	1	9.22	11.15	13.30
6075	25	9.57	11.63	13.73
6175	45	9.67	11.64	13.78
6275	65	9.8	11.5	13.74
6415	93	9.66	11.13	13.47
6435	97	9.93	10.38	13.17
6475	105	9.89	10.32	13.12
6515	113	9.78	10.33	13.07
6535	117	9.81	10.58	13.22
6675	145	10.02	10.61	13.34
6695	149	9.83	10.42	13.15
6875	185	9.54	11.17	13.44
6895	189	10.04	10.92	13.51
6995	209	10.03	11.04	13.57
7115	233	10.08	10.86	13.50

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**Table 3-2  
6 GHz WLAN Maximum Average RF Power – 802.11ax 20 MHz BW**

6GHz (20MHz) 802.11ax Conducted Power [dBm]				
Freq [MHz]	Channel	ANT1	ANT2	MIMO
5955	1	10.44	9.58	13.04
6075	25	10.42	10.10	13.27
6175	45	10.44	9.79	13.13
6275	65	10.87	10.21	13.56
6415	93	10.32	9.98	13.16
6435	97	10.63	10.23	13.44
6475	105	10.42	10.00	13.23
6515	113	10.50	9.88	13.21
6535	117	10.83	9.89	13.39
6675	145	10.64	10.00	13.34
6695	149	10.76	9.99	13.40
6875	185	10.84	9.86	13.39
6895	189	10.72	9.83	13.31
6995	209	10.88	9.91	13.43
7115	233	10.42	9.65	13.07

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

6GHz (40MHz) 802.11ax Conducted Power [dBm]				
Freq [MHz]	Channel	ANT1	ANT2	MIMO
5965	3	9.51	10.38	12.98
6085	27	8.90	9.70	12.33
6165	43	9.44	10.31	12.91
6285	67	9.89	9.99	12.95
6405	91	9.75	9.71	12.74
6445	99	10.41	9.11	12.82
6485	107	10.15	8.55	12.43
6525	115	10.24	8.99	12.67
6565	123	10.22	9.55	12.91
6685	147	9.71	9.21	12.48
6725	155	9.8	9.5	12.66
6845	179	9.65	9.01	12.35
6885	187	9.42	8.90	12.18
7005	211	10.6	9.13	12.94
7085	227	10.47	8.66	12.67

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**Table 3-4**  
**6 GHz WLAN Maximum Average RF Power – 802.11ax 80 MHz BW**

6GHz (80MHz) 802.11ax Conducted Power [dBm]				
Freq [MHz]	Channel	ANT1	ANT2	MIMO
5985	7	9.28	10.14	12.74
6065	23	8.50	9.75	12.18
6145	39	9.07	10.31	12.75
6305	71	9.70	9.44	12.58
6385	87	9.91	9.47	12.71
6465	103	10.03	9.12	12.61
6545	119	9.88	8.94	12.45
6705	151	10.56	9.2	12.94
6785	167	10.21	9.42	12.84
6865	183	9.51	8.99	12.27
6945	199	10.6	9.11	12.93
7025	215	10.17	8.66	12.49

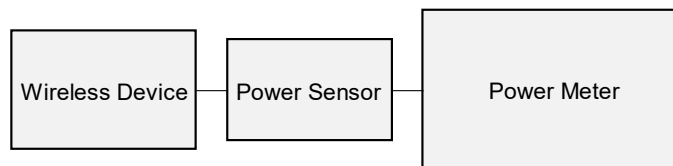
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**Table 3-5  
6 GHz WLAN Maximum Average RF Power – 802.11ax 160 MHz BW**

6GHz (160MHz) 802.11ax Conducted Power [dBm]				
Freq [MHz]	Channel	ANT1	ANT2	MIMO
6025	15	8.6	9.56	12.12
6185	47	8.9	10.32	12.68
6345	79	8.61	9.92	12.32
6505	111	10.09	8.99	12.59
6665	143	10.42	9.11	12.82
6825	175	10.01	8.96	12.53
6985	207	9.75	8.69	12.26

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 3-1  
Power Measurement Setup**

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# 4



## SYSTEM VERIFICATION

### 4.1 SAR Test System Verification

**Table 4-1  
Measured Tissue Properties**

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, $\sigma$ (S/m)	Measured Dielectric Constant, $\epsilon$	TARGET Conductivity, $\sigma$ (S/m)	TARGET Dielectric Constant, $\epsilon$	% dev $\sigma$	% dev $\epsilon$
10/12/2021	6500 Head	22.1	6000	5.507	34.274	5.480	35.100	0.49%	-2.35%
			6025	5.562	34.191	5.510	35.070	0.94%	-2.51%
			6065	5.564	34.170	5.557	35.022	0.13%	-2.43%
			6075	5.570	34.135	5.569	35.010	0.02%	-2.50%
			6085	5.589	34.102	5.580	34.998	0.16%	-2.56%
			6275	5.851	33.761	5.805	34.770	0.79%	-2.90%
			6285	5.854	33.760	5.816	34.758	0.65%	-2.87%
			6305	5.867	33.716	5.840	34.734	0.46%	-2.93%
			6345	5.938	33.621	5.887	34.686	0.87%	-3.07%
			6475	6.105	33.396	6.041	34.530	1.06%	-3.28%
			6485	6.121	33.389	6.052	34.518	1.14%	-3.27%
			6500	6.122	33.364	6.070	34.500	0.86%	-3.29%
			6505	6.124	33.359	6.076	34.494	0.79%	-3.29%
			6545	6.162	33.172	6.122	34.446	0.65%	-3.70%
			6675	6.317	32.960	6.273	34.290	0.70%	-3.88%
			6685	6.335	32.935	6.285	34.278	0.80%	-3.92%
			6785	6.439	32.757	6.400	34.158	0.61%	-4.10%
			6825	6.501	32.742	6.447	34.110	0.84%	-4.01%
			6985	6.635	32.490	6.633	33.918	0.03%	-4.21%
			6995	6.635	32.420	6.644	33.906	-0.14%	-4.38%
7000	6.639	32.385	6.650	33.900	-0.17%	-4.47%			
7005	6.649	32.355	6.656	33.894	-0.11%	-4.54%			
7025	6.703	32.254	6.680	33.870	0.34%	-4.77%			

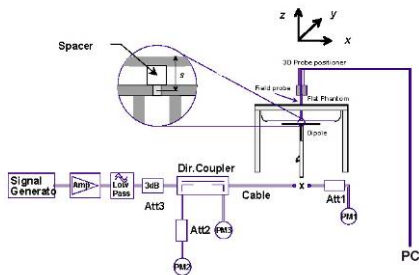
The above measured tissue parameters were used in the DASY software. The DASY software was used to perform interpolation to determine the dielectric parameters at the SAR test device frequencies (per KDB Publication 865664 D01v01r04 and IEEE 1528-2013 6.6.1.2). The tissue parameters listed in the SAR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

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Prior to SAR assessment, the system is verified to  $\pm 10\%$  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 4-2  
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 <sub>1g</sub> (W/kg)	1 W Target SAR <sub>1g</sub> (W/kg)	1 W Normalized SAR <sub>1g</sub> (W/kg)	Deviation <sub>1g</sub> (%)	Measured SAR <sub>10g</sub> (W/kg)	1 W Target SAR <sub>10g</sub> (W/kg)	1 W Normalized SAR <sub>10g</sub> (W/kg)	Deviation <sub>10g</sub> (%)	Measured 4cm <sup>2</sup> APD (W/m <sup>2</sup> )	1W Target 4cm <sup>2</sup> APD (W/m <sup>2</sup> )	1 W Normalized 4cm <sup>2</sup> APD (W/m <sup>2</sup> )	Deviation 4cm <sup>2</sup> APD (%)
M	6500	Head	10/12/2021	22.5	22.0	0.050	1018	7570	14.200	292.000	284.000	-2.74%	2.630	53.800	52.600	-2.23%	64.1000	1350.0000	1282.000	-5.04%



**Figure 4-1  
System Verification Setup Diagram**



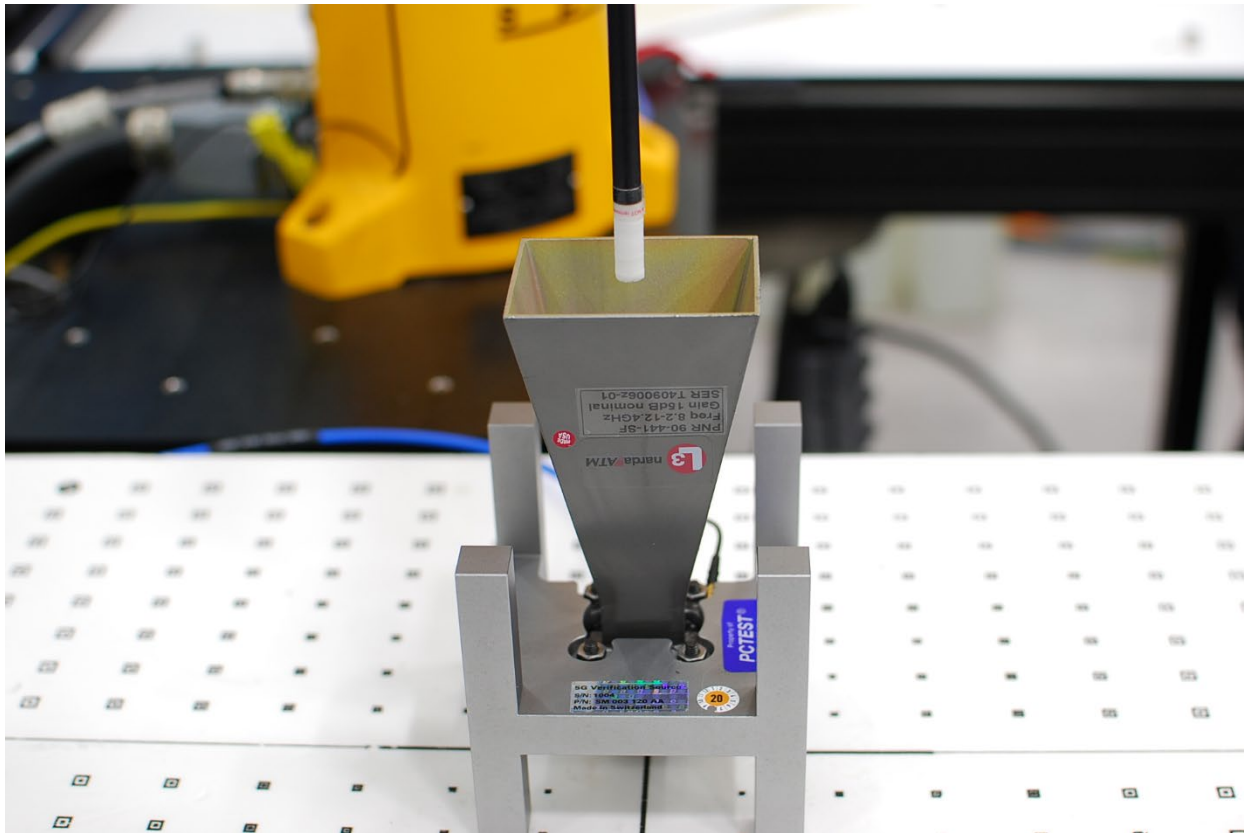
**Figure 4-2  
System Verification Setup Photo**

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## 4.2 Power Density Test System Verification

The system was verified to be within  $\pm 0.66$  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 4-3**  
**System Verification Setup Photo**




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**Table 4-3  
10 GHz Verifications**

System Verification											
System	Frequency (GHz)	Date	Source S/N	Probe S/N	Prad (mW)	Normal psPD (W/m <sup>2</sup> over 4 cm <sup>2</sup> )		Deviation (dB)	Total psPD (W/m <sup>2</sup> over 4 cm <sup>2</sup> )		Deviation (dB)
						Measured	Target		Measured	Target	
Q	10	10/13/2021	1004	9389	86.1	54.00	50.70	0.27	54.20	50.70	0.29
Q	10	10/15/2021	1004	9389	86.1	56.00	50.70	0.43	56.30	50.70	0.46
Q	10	10/19/2021	1004	9389	86.1	52.30	50.70	0.13	52.50	50.70	0.15

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

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# 5

## DATA SUMMARY

### 5.1 SAR and Absorbed Power Density Results

**Table 5-1  
6 GHz WLAN Head MIMO SAR**

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Maximum Allowed Power (Ant 2) [dBm]	Conducted Power (Ant 2) [dBm]	Power Drift [dB]	Side	Test Position	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)			(W/kg)	
6075.00	25	802.11ax	OFDM	20	11.0	10.42	11.0	10.10	-0.04	Right	Cheek	MIMO	UI70284M	16.3	96.5	0.085	1.231	1.036	0.108	
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	-0.14	Right	Cheek	MIMO	UI70284M	16.3	96.5	0.098	1.199	1.036	0.122	A1
6475.00	105	802.11ax	OFDM	20	11.0	10.42	11.0	10.00	0.12	Right	Cheek	MIMO	UI70284M	16.3	96.5	0.019	1.259	1.036	0.025	
6675.00	145	802.11ax	OFDM	20	11.0	10.64	11.0	10.00	-0.20	Right	Cheek	MIMO	UI70284M	16.3	96.5	0.024	1.260	1.036	0.031	
6995.00	209	802.11ax	OFDM	20	11.0	10.88	11.0	9.91	0.12	Right	Cheek	MIMO	UI70284M	16.3	96.5	0.077	1.286	1.036	0.103	
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	-0.16	Right	Tilt	MIMO	UI70284M	16.3	96.5	0.015	1.199	1.036	0.019	
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	-0.14	Left	Cheek	MIMO	UI70284M	16.3	96.5	0.063	1.199	1.036	0.078	
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	-0.10	Left	Tilt	MIMO	UI70284M	16.3	96.5	0.018	1.199	1.036	0.022	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram										

Note: To achieve the 14 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 11 dBm.

**Table 5-2  
6 GHz WLAN Body-worn MIMO SAR**



MEASUREMENT RESULTS																				
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Maximum Allowed Power (Ant 2) [dBm]	Conducted Power (Ant 2) [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)	
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	0.06	15	MIMO	UI70284M	16.3	Back	96.5	0.092	1.199	1.036	0.114	A2
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: To achieve the 14 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 11 dBm.

**Table 5-3  
6 GHz WLAN Phablet MIMO SAR**

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Maximum Allowed Power (Ant 2) [dBm]	Conducted Power (Ant 2) [dBm]	Power Drift [dB]	Spacing (mm)	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (10g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (10g)	Plot #
MHz	Ch.															(W/kg)			(W/kg)	
6075.00	25	802.11ax	OFDM	20	11.0	10.42	11.0	10.10	0.06	0	MIMO	UI70284M	16.3	Back	96.5	0.434	1.231	1.036	0.553	A3
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	-0.02	0	MIMO	UI70284M	16.3	Back	96.5	0.427	1.199	1.036	0.530	
6475.00	105	802.11ax	OFDM	20	11.0	10.42	11.0	10.00	0.18	0	MIMO	UI70284M	16.3	Back	96.5	0.367	1.259	1.036	0.479	
6675.00	145	802.11ax	OFDM	20	11.0	10.64	11.0	10.00	0.05	0	MIMO	UI70284M	16.3	Back	96.5	0.395	1.260	1.036	0.516	
6995.00	209	802.11ax	OFDM	20	11.0	10.88	11.0	9.91	0.05	0	MIMO	UI70284M	16.3	Back	96.5	0.404	1.286	1.036	0.538	
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	0.03	0	MIMO	UI70284M	16.3	Front	96.5	0.092	1.199	1.036	0.114	
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	0.07	0	MIMO	UI70284M	16.3	Top	96.5	0.023	1.199	1.036	0.029	
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	-0.13	0	MIMO	UI70284M	16.3	Left	96.5	0.062	1.199	1.036	0.077	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Phablet 4 W/kg (mW/g) averaged over 10 gram										

Note: To achieve the 14 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 11 dBm.

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**Table 5-4  
6 GHz WLAN Head MIMO Absorbed Power Density**

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Maximum Allowed Power (Ant 2) [dBm]	Conducted Power (Ant 2) [dBm]	Power Drift [dB]	Side	Test Position	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	Measured APD W/m <sup>2</sup> (4cm <sup>2</sup> )	Plot #
MHz	Ch.																
6075.00	25	802.11ax	OFDM	20	11.0	10.42	11.0	10.10	-0.04	Right	Cheek	MIMO	UI70284M	16.3	96.5	0.630	
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	-0.14	Right	Cheek	MIMO	UI70284M	16.3	96.5	0.738	A1
6475.00	105	802.11ax	OFDM	20	11.0	10.42	11.0	10.00	0.12	Right	Cheek	MIMO	UI70284M	16.3	96.5	0.143	
6675.00	145	802.11ax	OFDM	20	11.0	10.64	11.0	10.00	-0.20	Right	Cheek	MIMO	UI70284M	16.3	96.5	0.160	
6995.00	209	802.11ax	OFDM	20	11.0	10.88	11.0	9.91	0.12	Right	Cheek	MIMO	UI70284M	16.3	96.5	0.515	
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	-0.16	Right	Tilt	MIMO	UI70284M	16.3	96.5	0.080	
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	-0.14	Left	Cheek	MIMO	UI70284M	16.3	96.5	0.455	
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	-0.10	Left	Tilt	MIMO	UI70284M	16.3	96.5	0.122	

Note: To achieve the 14 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 11 dBm.

**Table 5-5  
6 GHz WLAN Body-worn MIMO Absorbed Power Density**




MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Maximum Allowed Power (Ant 2) [dBm]	Conducted Power (Ant 2) [dBm]	Power Drift [dB]	Spacing (mm)	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Measured APD W/m <sup>2</sup> (4cm <sup>2</sup> )	Plot #
MHz	Ch.																
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	0.06	15.0	MIMO	UI70284M	16.3	Back	96.5	0.724	A2

Note: To achieve the 14 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 11 dBm.

**Table 5-6  
6 GHz WLAN Phablet MIMO Absorbed Power Density**

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Maximum Allowed Power (Ant 2) [dBm]	Conducted Power (Ant 2) [dBm]	Power Drift [dB]	Spacing (mm)	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Measured APD W/m <sup>2</sup> (4cm <sup>2</sup> )	Plot #
MHz	Ch.																
6075.00	25	802.11ax	OFDM	20	11.0	10.42	11.0	10.10	0.06	0	MIMO	UI70284M	16.3	Back	96.5	10.400	A3
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	-0.02	0	MIMO	UI70284M	16.3	Back	96.5	10.300	
6475.00	105	802.11ax	OFDM	20	11.0	10.42	11.0	10.00	0.18	0	MIMO	UI70284M	16.3	Back	96.5	8.870	
6675.00	145	802.11ax	OFDM	20	11.0	10.64	11.0	10.00	0.05	0	MIMO	UI70284M	16.3	Back	96.5	9.590	
6995.00	209	802.11ax	OFDM	20	11.0	10.88	11.0	9.91	0.05	0	MIMO	UI70284M	16.3	Back	96.5	9.900	
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	0.03	0	MIMO	UI70284M	16.3	Front	96.5	2.100	
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	0.07	0	MIMO	UI70284M	16.3	Top	96.5	0.526	
6275.00	65	802.11ax	OFDM	20	11.0	10.87	11.0	10.21	-0.13	0	MIMO	UI70284M	16.3	Left	96.5	1.440	

Note: To achieve the 14 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 11 dBm.



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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 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical, and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
6. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 15 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
7. Per FCC KDB Publication 648474 D04v01r03, body-worn SAR was evaluated without a headset connected to the device. Since the standalone reported body-worn SAR was  $\leq 1.2$  W/kg, no additional body-worn SAR evaluations using a headset cable were required.
8. Per FCC KDB Publication 648474 D04v01r03, this device is considered a "phablet" since the diagonal dimension is  $> 160$  mm and  $< 200$  mm. Therefore, phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR  $> 1.2$  W/kg.
9. Unless otherwise noted, when 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds below.
10. 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 4cm<sup>2</sup> averaging area is reported based on SAR measurements.

WLAN Notes:




1. WIFI 6 GHz operations are limited to MIMO operations only (does not support stand-alone mode). Per KDB Publication 248227 D01v02r02, SAR for MIMO was evaluated by following the simultaneous SAR provisions from KDB Publication 447498 D01v06 by making a SAR measurement with both antennas transmitting simultaneously.
2. When the maximum reported 1g averaged SAR is  $\leq 0.8$  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  $\leq 1.20$  W/kg for 1g evaluations or all test channels were measured.
3. 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.
4. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

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## 5.2 Power Density Results



**Table 5-7  
6 GHz WLAN MIMO Power Density**

MEASUREMENT RESULTS																			
Frequency (MHz)	Channel	Mode	Service	Bandwidth [MHz]	Power Drift (dB)	Spacing (mm)	Antenna Config.	DUT Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Grid Step (λ)	IPD (W/m <sup>2</sup> )	Scaling Factor for Measurement Uncertainty per IEC 62479	Normal psPD (W/m <sup>2</sup> )	Scaled Normal psPD (W/m <sup>2</sup> )	Total psPD (W/m <sup>2</sup> )	Scaled Total psPD (W/m <sup>2</sup> )	Plot #
6075.00	25	802.11ax	OFDM	20	-0.12	2	MIMO	UI91224M	16.3	Back	96.5	0.05	N/A	1.554	3.24	5.03	3.61	5.61	
6275.00	65	802.11ax	OFDM	20	0.09	2	MIMO	UI91224M	16.3	Back	96.5	0.05	0.766	1.554	2.24	3.48	2.71	4.21	
6275.00	65	802.11ax	OFDM	20	0.04	9.56	MIMO	UI91224M	16.3	Back	96.5	0.05	0.80	1.554	1.43	2.22	1.65	2.56	
6475.00	105	802.11ax	OFDM	20	-0.03	2	MIMO	UI91224M	16.3	Back	96.5	0.05	N/A	1.554	2.99	4.65	3.44	5.35	
6675.00	145	802.11ax	OFDM	20	-0.04	2	MIMO	UI91224M	16.3	Back	96.5	0.05	N/A	1.554	3.23	5.02	3.76	5.84	
6995.00	209	802.11ax	OFDM	20	0.09	2	MIMO	UI91224M	16.3	Back	96.5	0.05	N/A	1.554	3.43	5.33	4.25	6.60	A4
6275.00	65	802.11ax	OFDM	20	0.03	2	MIMO	UI91224M	16.3	Front	96.5	0.05	N/A	1.554	0.681	1.06	0.861	1.34	
6275.00	65	802.11ax	OFDM	20	-0.09	2	MIMO	UI91224M	16.3	Top	96.5	0.05	N/A	1.554	0.322	0.500	0.344	0.535	
6275.00	65	802.11ax	OFDM	20	-0.03	2	MIMO	UI91224M	16.3	Left	96.5	0.05	N/A	1.554	0.822	1.28	1.080	1.68	
47 CFR §1.1310 - SAFETY LIMIT Spatial Average Uncontrolled Exposure / General Population								Power Density 10 W/m <sup>2</sup> averaged over 4 cm <sup>2</sup>											

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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  $\lambda/4$ .
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  $d=2\text{mm}$  and  $d=\lambda/5\text{mm}$  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  $\geq -1\text{dB}$ , the grid step was sufficient for determining compliance at  $d=2\text{mm}$ .
7. WIFI 6 GHz operations are limited to MIMO operations only (does not support stand-alone mode). psPD for MIMO was evaluated by making a measurement with both antennas transmitting simultaneously.

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## EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
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	N/A	CBT	N/A	433975
SPEAG	EUmmWV3	EUmmWV3 Probe	11/16/2020	Annual	11/16/2021	9389
SPEAG	SM 003 100 AA	10 GHz System Verification Antenna	8/12/2021	Annual	8/12/2022	1004
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/17/2020	Annual	11/17/2021	1638
SPEAG	EX3DV4	SAR Probe	12/15/2020	Annual	12/15/2021	7570
SPEAG	DAE4	Dasy Data Acquisition Electronics	12/7/2020	Annual	12/7/2021	859
SPEAG	D6.5GHzV2	6.5GHz SAR Dipole	12/11/2020	Annual	12/11/2021	1018
Control Company	4352	Long Stem Thermometer	1/24/2020	Biennial	1/24/2022	200043634
Agilent	SMF100A	Signal Generator	5/7/2020	Biennial	5/7/2022	101590
Rohde & Schwarz	SMU200A	Vector Signal Generator	5/12/2020	Biennial	5/12/2022	104145
Agilent	8753ES	S-Parameter Vector Network Analyzer	2/2/2021	Annual	2/2/2022	US39170122
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/12/2021	Annual	5/12/2022	1070

## Note:

- Each equipment item was used solely within its respective calibration period.
- 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.



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# 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 <sub>i</sub> lgm	c <sub>i</sub> 10 gms	lgm u <sub>i</sub> (± %)	10gms u <sub>i</sub> (± %)	v <sub>i</sub>	
<b>Measurement System</b>										
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	∞	
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	0.4	R	1.732	1	1	0.2	0.2	∞	
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	∞	
<b>Test Sample Related</b>										
Test Sample Positioning	E.4.2	2.70	N	1	1	1	2.7	2.7	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	∞	
<b>Phantom &amp; Tissue Parameters</b>										
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	4.2	N	1	0.78	0.71	3.3	3.0	76	
Liquid Permittivity - measurement uncertainty	E.3.3	4.1	N	1	0.23	0.26	0.9	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 Uncertainty	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	∞	
<b>Combined Standard Uncertainty (k=1)</b>							RSS	13.3	13.1	191
<b>Expanded Uncertainty (95% CONFIDENCE LEVEL)</b>							k=2	26.5	26.1	

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Applicable for Power Density Measurements:




a	b	c	d	e	f = c x f/e	g
Uncertainty Component	Unc. (± dB)	Prob. Dist.	Div.	c <sub>i</sub>	u <sub>i</sub> (± dB)	v <sub>i</sub>
<b>Measurement System</b>						
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 Mechanical Offset	0.00	R	1.73	1	0.00	∞
Probe Spatial Resolution	0.00	R	1.73	1	0.00	∞
Field Impedance Dependence	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	∞
<b>Test Sample Related</b>						
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	∞
<b>Combined Standard Uncertainty (k=1)</b>		RSS			1.34	∞
<b>Expanded Uncertainty</b> (95% CONFIDENCE LEVEL)		k=2			2.68	

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### 9.1 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.

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