



FCC 47 CFR § 2.1093  
IEC/IEEE Std 62209-1528 : 2020  
IEC TR 63170 : 2018

**RF EVALUATION REPORT (Above 6GHz)**

**FOR**

**GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, NFC, WPT and UWB**

**MODEL NUMBER: SM-S918B/DS, SM-S918B**

**FCC ID: A3LSMS918B**

**REPORT NUMBER: 4790541052-S2V2**

**ISSUE DATE: 11/9/2022**

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**TL-637**

**Revision History**

Rev.	Date	Revisions	Revised By
V1	10/28/2022	Initial Issue	--
V2	11/9/2022	Added 6E SAR test at UNII-6 and UNII-8 Sec. 8 & 9.3 & 10.1	Seungyeon Kim
		-	

## Table of Contents

<b>1. Attestation of Test Results .....</b>	<b>5</b>
<b>2. Test Specification, Methods and Procedures.....</b>	<b>6</b>
<b>3. Facilities and Accreditation.....</b>	<b>6</b>
<b>4. SAR and Power Density Measurement System &amp; Test Equipment.....</b>	<b>7</b>
4.1. SAR Measurement System.....	7
4.1.1. SAR Scan Procedures.....	8
4.2. Incident Power Density Measurement System.....	10
4.2.1. Power Density Scan Procedures .....	11
4.2.2. Total Field and Power Flux Density Reconstruction(measurement distance) .....	11
4.3. Test Equipment.....	12
4.3.1. SAR Test Equipment .....	12
4.3.2 Incident Power Density Test Equipment.....	12
<b>5. Measurement Uncertainty.....</b>	<b>13</b>
5.1. SAR Measurement Uncertainty.....	13
5.1.1. Decision rule.....	13
5.2. Incident Power Density Measurement Uncertainty.....	14
5.2.1. Decision rule.....	14
<b>6. Device Under Test (DUT) Information .....</b>	<b>15</b>
6.1. DUT Description .....	15
6.2. Wireless Technologies of UNII 6e.....	15
6.3. Nominal Maximum and Reduced Output Power.....	16
<b>7. RF Exposure Conditions (Test Configurations).....</b>	<b>16</b>
<b>8. SAR System Check with Dielectric Property Measurements .....</b>	<b>17</b>
8.1. Dielectric Property Measurements .....	17
8.2. System Check.....	19
<b>9. IPD(Incident Power Density) System with Dielectric Property .....</b>	<b>20</b>
9.1. Dielectric Property .....	20
9.2. System Check.....	20
9.3. Wi-Fi 6 GHz (U-NII Bands).....	21
<b>10. SAR and APD(Absorbed Power Density) Results.....</b>	<b>22</b>
10.1. WiFi (UNII Bands-Above 6GHz).....	23
10.2. UWB.....	25
<b>11. IPD(Incident Power density) Results .....</b>	<b>26</b>

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11.1. *WiFi (UNII Bands-Above 6GHz)*..... 26

11.2. *UWB*..... 27

**12. Simultaneous Transmission Analysis ..... 27**

*4790541052-S2 FCC Report Above 6GHz\_App A\_PD Photos & Ant. Locations*..... 28

*4790541052-S2 FCC Report Above 6GHz\_App B\_Highest SAR and PD Test Plots* ..... 28



*4790541052-S2 FCC Report Above 6GHz\_App C\_System Check Plots* ..... 28

*4790541052-S2 FCC Report Above 6GHz\_App D\_SAR Tissue Ingredients*..... 28

*4790541052-S2 FCC Report Above 6GHz\_App E\_Probe Cal. Certificates*..... 28

*4790541052-S2 FCC Report Above 6GHz\_App F\_Dipole and Horn antenna Cal. Certificates* ..... 28

### 1. Attestation of Test Results

Applicant Name	SAMSUNG ELECTRONICS CO.,LTD.					
FCC ID	A3LSMS918B					
Model Number	SM- S918B/DS, SM-S918B					
Applicable Standards	FCC 47 CFR § 2.1093 IEC/IEEE Std 62209-1528 : 2020 IEC TR 63170 : 2018 Published RF exposure KDB procedures					
Exposure Category	SAR Limits (W/Kg)		Power Density Limits (mW/cm <sup>2</sup> over 4cm <sup>2</sup> )			
	Peak spatial-average (1g of tissue)	Product Specific 10g (10g of tissue)	APD (Absorbed Power Density)		IPD (Incident Power Density)	
General population / Uncontrolled exposure	1.6	4.0	N/A		1.0	
RF Exposure Conditions	Equipment Class					
	The Highest Reported SAR (W/kg)		APD (mW/cm <sup>2</sup> )		IPD (mW/cm <sup>2</sup> )	
	6CD	UWB	6CD	UWB	6CD	UWB
Head	0.087	N/A	0.039	N/A	0.436	0.012
Body-worn	0.146	N/A	0.098	N/A		
Hotspot	N/A	N/A	N/A	N/A		
Product Specific 10g	0.217	0.002	0.433	0.004		
Date Tested	10/12/2022 to 11/7/2022					
Test Results	Pass					
<p>UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p> <p><b>Note:</b> The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.</p>						
Approved & Released By:			Prepared By:			
						
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## 2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE Std 1528-2013, IEC TR 63170-2018, IEC 62479:2010 the following FCC Published RF exposure [KDB](#) procedures:

- 248227 D01 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 648474 D04 Handset SAR v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 941225 D07 UMPC Mini Tablet v01r02

In addition to the above, the following information was used:

- [TCB workshop](#) April, 2021; RF Exposure Policies (U-NII 6-7 GHz Interim Procedures)
- SPEAG, 5G Module Application Note: 5G Compliance Testing
- SPEAG DASY6 Application Note : Interim Procedures for Devices Operating at 6 – 10 GHz

## 3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at

Suwon
SAR 7 Room
SAR 8 Room
SAR 9 Room

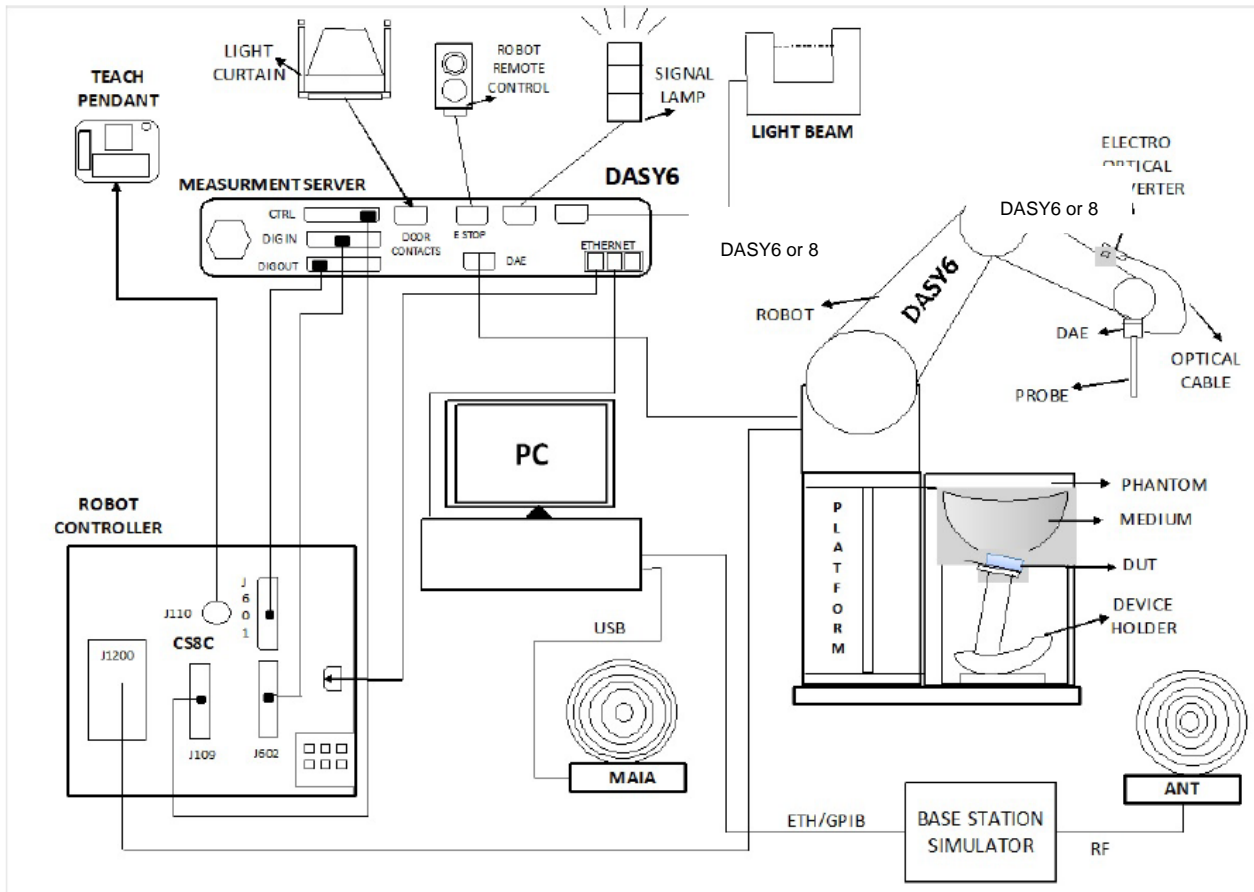
UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637.

The full scope of accreditation can be viewed at <https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf>.

## 4. SAR and Power Density Measurement System & Test Equipment

### 4.1. SAR Measurement System

The DASY6 & 8 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win10 and the DASY6 or 8 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

### 4.1.1. SAR Scan Procedures

#### Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

#### Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEC/IEEE Standard 62209-1528, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Parameters extracted from IEC/IEEE Standard 62209-1528.

Parameter	DUT transmit frequency being tested	
	$f \leq 3 \text{ GHz}$	$3 \text{ GHz} < f \leq 10 \text{ GHz}$
Maximum distance between the measured points (geometric centre of the sensors) and the inner phantom surface ( $z_{M1}$ in Figure 20 in mm)	$5 \pm 1$	$\delta \ln(2)/2 \pm 0,5^a$
Maximum spacing between adjacent measured points in mm (see O.8.3.1) <sup>b</sup>	20, or half of the corresponding zoom scan length, whichever is smaller	$60/f$ , or half of the corresponding zoom scan length, whichever is smaller
Maximum angle between the probe axis and the phantom surface normal ( $\alpha$ in Figure 20) <sup>c</sup>	5° (flat phantom only) 30° (other phantoms)	5° (flat phantom only) 20° (other phantoms)
Tolerance in the probe angle	1°	1°

<sup>a</sup>  $\delta$  is the penetration depth for a plane-wave incident normally on a planar half-space.

<sup>b</sup> See Clause O.8 on how  $\Delta x$  and  $\Delta y$  may be selected for individual area scan requirements.

<sup>c</sup> The probe angle relative to the phantom surface normal is restricted due to the degradation in the measurement accuracy in fields with steep spatial gradients. The measurement accuracy decreases with increasing probe angle and increasing frequency. This is the reason for the tighter probe angle restriction at frequencies above 3 GHz.



**Step 3: Zoom Scan**

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Zoom Scan Parameters extracted from IEC/IEEE Standard 62209-1528.

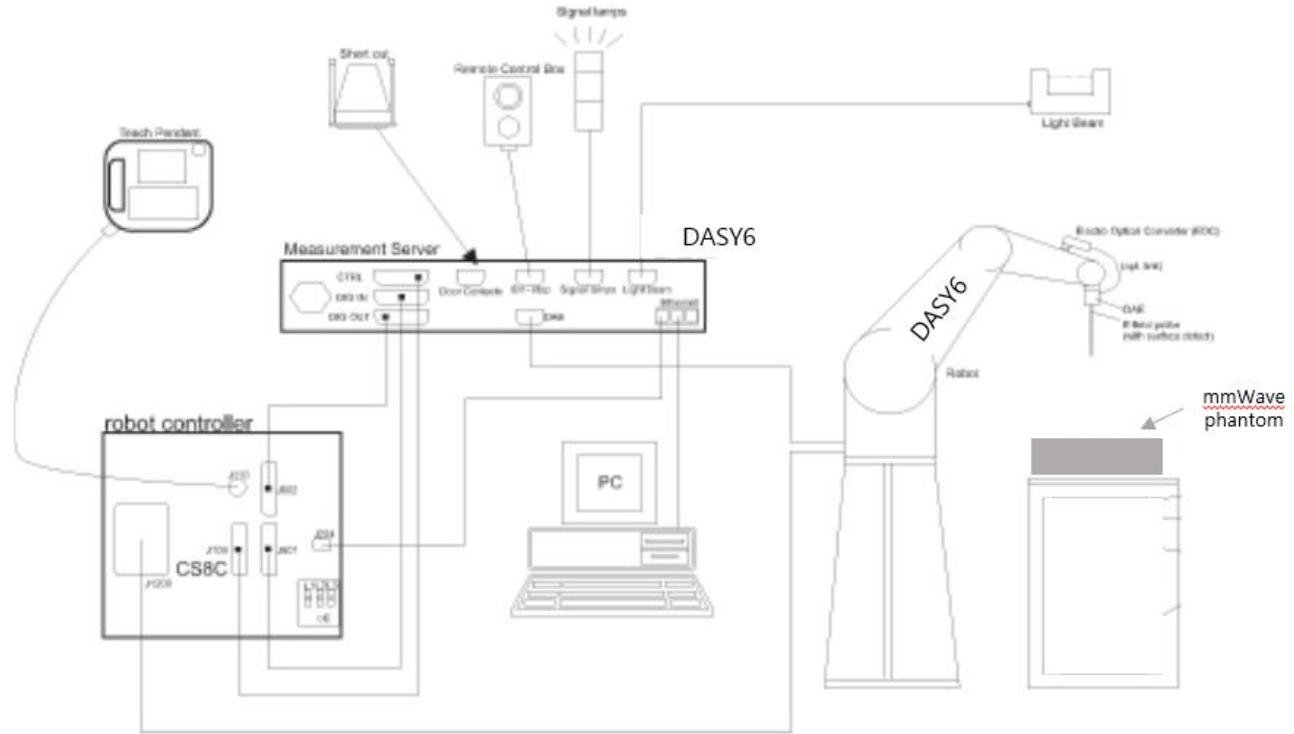
Parameter	DUT transmit frequency being tested	
	$f \leq 3$ GHz	$3$ GHz $< f \leq 10$ GHz
Maximum distance between the closest measured points and the phantom surface ( $z_{M1}$ in Figure 20 and Table 3, in mm)	5	$\delta \ln(2)/2^a$
Maximum angle between the probe axis and the phantom surface normal ( $\alpha$ in Figure 20)	5° (flat phantom only) 30° (other phantoms)	5° (flat phantom only) 20° (other phantoms)
Maximum spacing between measured points in the $x$ - and $y$ -directions ( $\Delta x$ and $\Delta y$ , in mm)	8	$24/f^b$
For uniform grids: Maximum spacing between measured points in the direction normal to the phantom shell ( $\Delta z_1$ in Figure 20, in mm)	5	$10/(f - 1)$
For graded grids: Maximum spacing between the two closest measured points in the direction normal to the phantom shell ( $\Delta z_1$ in Figure 20, in mm)	4	$12/f$
For graded grids: Maximum incremental increase in the spacing between measured points in the direction normal to the phantom shell ( $R_z = \Delta z_2/\Delta z_1$ in Figure 20)	1,5	1,5
Minimum edge length of the zoom scan volume in the $x$ - and $y$ -directions ( $L_z$ in O.8.3.2, in mm)	30	22
Minimum edge length of the zoom scan volume in the direction normal to the phantom shell ( $L_h$ in O.8.3.2 in mm)	30	22
Tolerance in the probe angle	1°	1°
<sup>a</sup> $\delta$ is the penetration depth for a plane-wave incident normally on a planar half-space.		
<sup>b</sup> This is the maximum spacing allowed, which might not work for all circumstances.		

**Step 4: Power drift measurement**

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

## 4.2. Incident Power Density Measurement System

The DASY6 & 8 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- The EUmmWVx probe is based on the pseudo-vector probe design, which not only measures the field magnitude but also derives its polarization ellipse.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win10 and the DASY6 or 8 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom which is specialized for 5G other accessories according to the targeted measurement.

### 4.2.1. Power Density Scan Procedures

#### Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to device under test.

#### Step 2: 5G Scan

The steps in the X, Y, and Z directions are specified in terms of fractions of the signal wavelength,  $\lambda$ . Area Scan Parameters extracted from SPEAG, 5G Module V1.2 Application Note.

#### Recommended settings for measurement of verification sources

Frequency [GHz]	Grid step	Grid extent X/Y [mm]	Measurement points
10	$0.25 \left(\frac{\lambda}{4}\right)$	120/120	16 × 16
30	$0.25 \left(\frac{\lambda}{4}\right)$	60/60	24 × 24
60	$0.25 \left(\frac{\lambda}{4}\right)$	31/31	26 × 26
90	$0.25 \left(\frac{\lambda}{4}\right)$	29/29	35 × 35

The minimum distance of probe sensors to verification source surface, horn antenna, is 10 mm.

Per equipment manufacturer guidance for 6 – 10GHz, Power density was measured at  $d=2\text{mm}$  and  $d=\lambda/5\text{mm}$  using 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  $d=2\text{mm}$ .

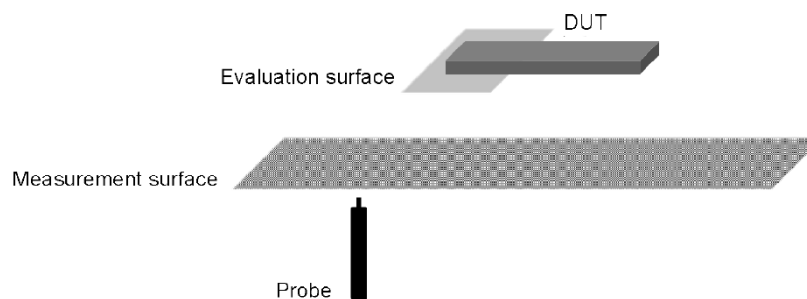
#### Step 3: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1. When the drift is larger than  $\pm 5\%$ , test is repeated from step1.

### 4.2.2. Total Field and Power Flux Density Reconstruction(measurement distance)

Reconstruction algorithms are used to project or transform the measured fields from the measurement surface to the evaluation surface (below fig) in order to determine power density or to compute spatial-average and/or local power density with known uncertainty.

Manufacture has developed a reconstruction approach based on the Gerchberg-Saxton algorithm, which benefits from the availability of the E-field polarization ellipse information obtained with the EUmmWVx probe. This reconstruction algorithm, together with the ability of the probe to measure extremely close to the source without perturbing the field, permits reconstruction of the E- and H-fields, as well as of the power density, on measurement planes.



### 4.3. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

#### 4.3.1. SAR Test Equipment

##### Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	ROHDE & SCHWARZ	ZNB 20	102256	8-5-2023
Dielectric Assessment Kit	SPEAG	DAK-3.5	1196	7-25-2023
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	LKM	DTM3000	3851	8-3-2023
Thermometer	LKM	DTM3000	3862	8-3-2023

##### System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
MXG Analog Signal Generator	Keysight	N5181B	MY59100587	8-4-2023
MXG Analog Signal Generator	Keysight	N5173B	MY59101083	8-4-2023
Power Sensor	Keysight	U2000A	MY60180020	8-3-2023
Power Sensor	Agilent	U2000A	MY54260007	8-3-2023
Power Sensor	Keysight	U2000A	MY60490008	8-3-2023
Power Sensor	Keysight	U2000A	MY61060004	8-3-2023
Power Sensor	Keysight	U2000A	MY61010006	8-3-2023
Power Amplifier	MINI-CIRCUITS	ZVE-3W-183+	311602009	8-4-2023
Directional Coupler	MINI-CIRCUITS	ZUDC20-183+	N/A	8-3-2023
Directional Coupler	MINI-CIRCUITS	ZUDC20-183+	N/A	8-3-2023
Low Pass Filter	Wainwright Instruments	WLKX10-11000 -13640-21000-60TS	1	8-2-2023
Attenuator	KEYSIGHT	8491B/010	MY39271981	8-3-2023
Attenuator	KEYSIGHT	8491B/010	MY39272011	8-2-2023
Attenuator	KEYSIGHT	8491B/020	MY39271973	8-3-2023
Attenuator	MINI-CIRCUITS	BW-S3W10+	N/A	4-7-2023
E-Field Probe	SPEAG	EX3DV4	7376	7-27-2023
E-Field Probe	SPEAG	EX3DV4	7545	8-19-2023
Data Acquisition Electronics	SPEAG	DAE4	1591	3-24-2023
System Validation Dipole	SPEAG	D6.5GHzV2	1010	5-27-2023
System Validation Dipole	SPEAG	D8GHzV2	1008	6-10-2023
Thermometer	Lutron	MHB-382SD	AK.18789	8-9-2023

#### 4.3.2 Incident Power Density Test Equipment

##### System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
MXG Analog Signal Generator	Keysight	N5173B	MY59101083	8-4-2023
Power Sensor	Keysight	U2000A	MY60180020	8-3-2023
Power Sensor	Agilent	U2000A	MY54260007	8-3-2023
Power Amplifier	MINI-CIRCUITS	ZVE-3W-183+	311602009	8-4-2023
Directional Coupler	MINI-CIRCUITS	ZUDC20-183+	N/A	8-3-2023
Directional Coupler	MINI-CIRCUITS	ZUDC20-183+	N/A	8-3-2023
Low Pass Filter	Wainwright Instruments	WLKX10-11000-13640-21000-60TS	1	8-2-2023
Attenuator	KEYSIGHT	8491B/010	MY39271981	8-3-2023
Attenuator	KEYSIGHT	8491B/010	MY39272011	8-2-2023
Attenuator	KEYSIGHT	8491B/020	MY39271973	8-3-2023
Attenuator	MINI-CIRCUITS	BW-S3W10+	N/A	4-7-2023
5G Probe	SPEAG	EUmmWV4	9493	1-27-2023
5G Probe	SPEAG	EUmmWV4	9536	2-28-2023
Data Acquisition Electronics	SPEAG	DAE4	1670	6-7-2023
Data Acquisition Electronics	SPEAG	DAE4	1447	3-25-2023
5G Verification Source (10GHz)	SPEAG	5G Verification Source_10GHz	1022	3-1-2023
Thermometer	Lutron	MHB-382SD	AK12102	8-9-2023

##### Note(s):

1. For SAR System Validation Dipole, Calibration interval applied every 2 years according to referencing KDB 865664 guidance.
2. Refer to Appendix F that mentioned about justification for Extended SAR Dipole Calibrations.

## 5. Measurement Uncertainty

### 5.1. SAR Measurement Uncertainty

#### Measurement uncertainty for 6 GHz to 10 GHz

(According to IEEE 62209-1528)

a	b	c		d	e f(d,k)	f	g	h = cx/f/e	l = cxg/e	k	
		Tol. 1 g (±%)	Tol. 10 g (±%)								Prob. Dist.
<b>Measurement System Errors</b>											
Probe Calibration	8.4.1.1	18.6		Normal	2	1	1	9.3	9.3	∞	
Probe Calibration Drift	8.4.1.2	1.7		Rectangular	1.732	1	1	1.0	1.0	∞	
Probe Linearity	8.4.1.3	4.7		Rectangular	1.732	1	1	2.7	2.7	∞	
Broadband Signal	8.4.1.4	2.8		Rectangular	1.732	1	1	1.6	1.6	∞	
Probe Isotropy	8.4.1.5	7.6		Rectangular	1.732	1	1	4.4	4.4	∞	
Data Acquisition	8.4.1.6	0.3		Normal	1	1	1	0.3	0.3	∞	
RF Ambient	8.4.1.7	1.8		Normal	1	1	1	1.8	1.8	∞	
Probe Positioning	8.4.1.8	0.005		Normal	1	0.50	0.50	0.25	0.25	∞	
Data Processing	8.4.1.9	3.5		Normal	1	1	1	3.5	3.5	∞	
<b>Phantom and Device Errors</b>											
Conductivity (meas.)DAK	8.4.2.1	2.5		Normal	1	0.78	0.71	2.0	1.8	∞	
Conductivity (temp.)BB	8.4.2.2	2.4		Rectangular	1.732	0.78	0.71	1.1	1.0	∞	
Phantom Permittivity	8.4.2.3	14.0		Rectangular	1.732	0	0	0.0	0.0	∞	
Distance DUT -TSL	8.4.2.4	2.0		Normal	1	2	2	4.0	4.0	∞	
Device Positioning	8.4.2.5	3.8	4.5	Normal	1	1	1	3.8	4.5	50	
Device Holder	8.4.2.6	3.6		Normal	1	1	1	3.6	3.6	∞	
DUT Modulation	8.4.2.7	2.4		Rectangular	1.732	1	1	1.4	1.4	∞	
Time-average SAR	8.4.2.8	1.7		Rectangular	1.732	1	1	1.0	1.0	∞	
DUT drift	8.4.2.9	5.0		Normal	1	1	1	5.0	5.0	∞	
<b>Correction to the SAR results</b>											
Deviation to Target	8.4.3.1	1.9		Normal	1	1	0.84	1.9	1.6	∞	
Combined Standard Uncertainty Uc(y) =								RSS	14.58	14.68	
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =									29.15	29.37	

#### 5.1.1. Decision rule

Decision rule for statement(s) of conformity is based on Procedures 1, Clause 4.4.2 in IEC Guide 115:2007.

## 5.2. Incident Power Density Measurement Uncertainty

Measurement Uncertainty for cDASY6 Module mmWave						
Error Description	Uncertainty value ( $\pm$ dB)	Probe Dist.	Divisor	(Ci)	Std. Unc. ( $\pm$ dB)	(Vi)
<b>Uncertainty terms dependent on the measurement system</b>						
Calibration	0.49	Normal	1	1	0.49	Infinity
Probe correction	0.00	Rectangular	1.73	1	0.00	Infinity
Frequency response (BW $\leq$ 1 GHz)	0.20	Rectangular	1.73	1	0.12	Infinity
Sensor cross coupling	0.00	Rectangular	1.73	1	0.00	Infinity
Isotropy	0.50	Rectangular	1.73	1	0.29	Infinity
Linearity	0.20	Rectangular	1.73	1	0.12	Infinity
Probe scattering	0.00	Rectangular	1.73	1	0.00	Infinity
Probe positioning offset	0.30	Rectangular	1.73	1	0.17	Infinity
Probe positioning repeatability	0.04	Rectangular	1.73	1	0.02	Infinity
Sensor mechanical offset	0.00	Rectangular	1.73	1	0.00	Infinity
Probe spatial resolution	0.00	Rectangular	1.73	1	0.00	Infinity
Field impedance dependance	0.00	Rectangular	1.73	1	0.00	Infinity
Amplitude and phase drift	0.00	Rectangular	1.73	1	0.00	Infinity
Amplitude and phase noise	0.04	Rectangular	1.73	1	0.02	Infinity
Measurement area truncation	0.10	Rectangular	1.73	1	0.06	Infinity
Data acquisition	0.03	Normal	1.00	1	0.03	Infinity
Sampling	0.00	Rectangular	1.73	1	0.00	Infinity
Field reconstruction	1.97	Rectangular	1.73	1	1.14	Infinity
Forward transformation	0.00	Rectangular	1.73	1	0.00	Infinity
Power density scaling	-	Rectangular	1.73	1	-	Infinity
Spatial averaging	0.10	Rectangular	1.73	1	0.06	Infinity
System detection limit	0.04	Rectangular	1.73	1	0.02	Infinity
<b>Uncertainty terms dependent on the DUT and environmental factors</b>						
Probe coupling with DUT	0.00	Rectangular	1.73	1	0.00	Infinity
Modulation response	0.40	Rectangular	1.73	1	0.23	Infinity
Integration time	0.00	Rectangular	1.73	1	0.00	Infinity
Response time	0.00	Rectangular	1.73	1	0.00	Infinity
Device holder influence	0.10	Rectangular	1.73	1	0.06	Infinity
DUT alignment	0.00	Rectangular	1.73	1	0.00	Infinity
RF ambient conditions	0.04	Rectangular	1.73	1	0.02	Infinity
Ambient reflections	0.04	Rectangular	1.73	1	0.02	Infinity
Immunity / secondary reception	0.00	Rectangular	1.73	1	0.00	Infinity
Drift of the DUT	0.22	Rectangular	1.73	1	0.13	Infinity
Combined Std. Uncertainty					1.33	
<b>Expanded Standard Uncertainty (95%)</b>					<b>2.65</b>	

### 5.2.1. Decision rule

Decision rule for statement(s) of conformity is based on Procedures 2, Clause 4.4.3 in IEC Guide 115:2007.

## 6. Device Under Test (DUT) Information

### 6.1. DUT Description

Device Dimension	Refer to Appendix A.		
Back Cover	<input checked="" type="checkbox"/> The Back Cover is not removable.		
Battery Options	<input checked="" type="checkbox"/> The rechargeable battery is not user accessible		
Test Sample Information	<b>No.</b>	<b>S/N</b>	<b>Notes</b>
	1	R3CT7081YTB	Conducted
	2	R3CT7081XZJ	Conducted
	3	R3CT70824NX	Radiated
	4	R3CT90EYVXZ	Radiated
	5	R3CT90WSH7P	Radiated
	6	R3CT90WSG6T	Radiated
	7	R3CT90WSFPW	Radiated

### 6.2. Wireless Technologies of UNII 6e

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR & PD testing
Wi-Fi_UNII 6e (Above 6GHz)	UNII Band 5 (5925-6425 MHz) UNII Band 6 (6425-6525 MHz) UNII Band 7 (6525-6885 MHz) UNII Band 8 (6885-7125 MHz)	802.11a 802.11ax (HE20) 802.11ax (HE40) 802.11ax (HE80) 802.11ax (HE160)	99.7% (802.11ax (HE40)) 99.7% (802.11ax (HE160))
UWB	Ch.5 (6489.6 MHz) Ch.9 (7987.2 MHz)	Signal Configurations(0/1/3), PRF modes(BPRF/HPRF)	100%

**Notes:**

- Duty cycle for Wi-Fi is referenced from the UNII report.



### 6.3. Nominal Maximum and Reduced Output Power

RF Air interface	Mode	Indoor AP			Standard AP					
		Max. RF Output Power (dBm)			Max. RF Output Power (dBm)			Reduced. RF Output Power (dBm)		
		WLAN Ant.1	WLAN Ant.2	MIMO (Ant.1+Ant.2)	WLAN Ant.1	WLAN Ant.2	MIMO (Ant.1+Ant.2)	WLAN Ant.1	WLAN Ant.2	MIMO (Ant.1+Ant.2)
WiFi 6 GHz (UNII - 5)	802.11a	9.0	9.0	12.0	12.0	12.0	15.0	10.0	10.0	13.0
	802.11ax HE20	9.0	9.0	12.0	12.0	12.0	15.0	10.0	10.0	13.0
	802.11ax HE40	9.0	9.0	12.0	12.0	12.0	15.0	10.0	10.0	13.0
	802.11ax HE80	9.0	9.0	12.0	11.0	11.0	14.0	10.0	10.0	13.0
WiFi 6 GHz (UNII - 6)	802.11a	9.0	9.0	12.0						
	802.11ax HE20	9.0	9.0	12.0						
	802.11ax HE40	9.0	9.0	12.0						
	802.11ax HE80	9.0	9.0	12.0						
WiFi 6 GHz (UNII - 7)	802.11a	9.0	9.0	12.0	12.0	12.0	15.0	10.0	10.0	13.0
	802.11ax HE20	9.0	9.0	12.0	12.0	12.0	15.0	10.0	10.0	13.0
	802.11ax HE40	9.0	9.0	12.0	12.0	12.0	15.0	10.0	10.0	13.0
	802.11ax HE80	9.0	9.0	12.0	11.0	11.0	14.0	10.0	10.0	13.0
WiFi 6 GHz (UNII - 8)	802.11a	9.0	9.0	12.0						
	802.11ax HE20	9.0	9.0	12.0						
	802.11ax HE40	9.0	9.0	12.0						
	802.11ax HE80	9.0	9.0	12.0						

**Note(s):**

1. Only MIMO mode supports for UNII 6e Bands.
2. This device has support Dual Client (6CD) in UNII 6-7GHz. So Indoor AP support to UNII 5 – 8, and Standard AP supports to UNII5, 7.

### 7. RF Exposure Conditions (Test Configurations)

Refer to Appendix A for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

Wireless technologies	RF Exposure Conditions	Antenna	DUT-to-User Separation	Test Position	Antenna-to-edge/surface	SAR Required	Note
UNII 6e	Head	WiFi 6G MIMO	0 mm	Left Touch	N/A	Yes	
				Left Tilt (15°)	N/A	Yes	
				Right Touch	N/A	Yes	
				Right Tilt (15°)	N/A	Yes	
	Body		15 mm	Rear	N/A	Yes	
				Front	N/A	Yes	
				Rear	< 25 mm	Yes	
				Front	< 25 mm	Yes	
	Product Specific 10-g		0 mm	Edge 1 (Top)	< 25 mm	Yes	
				Edge 2 (Right)	< 25 mm	Yes	
				Edge 3 (Bottom)	> 25 mm	No	1
				Edge 4 (Left)	< 25 mm	Yes	
UWB	Product Specific 10-g	Antenna 1	0 mm	Rear	< 25 mm	Yes	
				Front	< 25 mm	Yes	
				Edge 1 (Top)	> 25 mm	No	
				Edge 2 (Right)	> 25 mm	No	
				Edge 3 (Bottom)	> 25 mm	No	1
				Edge 4 (Left)	< 25 mm	Yes	
		Antenna 2	0 mm	Rear	< 25 mm	Yes	
				Front	< 25 mm	Yes	
				Edge 1 (Top)	< 25 mm	Yes	
				Edge 2 (Right)	> 25 mm	No	
				Edge 3 (Bottom)	> 25 mm	No	1
				Edge 4 (Left)	< 25 mm	Yes	

**Notes:**

1. SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR.
2. For Phablet devices: When hotspot mode applies, Product specific 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.
3. For Phablet devices: When hotspot mode is not supported, Product specific 10-g SAR is required for all surfaces and edges with an antenna located at ≤ 25mm from that surface or edge in direct contact with a flat phantom, to address interactive hand use exposure conditions.
4. Per manufacturer guide, UWB SAR was considered about only hand held condition (Product Specific 10-g).



## 8. SAR System Check with Dielectric Property Measurements

### 8.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after 1 days of use; for example, when the parameters are marginal at the beginning of the measurement series. Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

#### Tissue Dielectric Parameters

Refer to Table 2 within the IEC/IEEE Std 62209-1528 : 2020

Target Frequency (MHz)	Tissue parameters	
	$\epsilon_r$	$\sigma$ (S/m)
5800	35.3	5.27
6000	35.1	5.48
6500	34.5	6.07
7000	33.9	6.65
7500	33.3	7.24
8000	32.7	7.84
8500	32.1	8.46

#### Dielectric Property Measurements Results: SAR 7 Room

Date	Freq. (MHz)		Liquid Parameters	Measured	Target	Delta (%)	Limit ±(%)		
10/11/2022	Head 6000	e'	35.7000	Relative Permittivity ( $\epsilon_r$ ):	35.70	35.10	1.71	5	
		e"	15.7600	Conductivity ( $\sigma$ ):	5.26	5.48	-4.05	5	
	Head 6200	e'	35.3700	Relative Permittivity ( $\epsilon_r$ ):	35.37	34.86	1.46	5	
		e"	16.0600	Conductivity ( $\sigma$ ):	5.54	5.72	-3.14	5	
	Head 6500	e'	34.9500	Relative Permittivity ( $\epsilon_r$ ):	34.95	34.50	1.30	5	
		e"	16.3400	Conductivity ( $\sigma$ ):	5.91	6.07	-2.71	5	
	Head 6600	e'	34.8000	Relative Permittivity ( $\epsilon_r$ ):	34.80	34.38	1.22	5	
		e"	16.4600	Conductivity ( $\sigma$ ):	6.04	6.19	-2.35	5	
	Head 6800	e'	34.5400	Relative Permittivity ( $\epsilon_r$ ):	34.54	34.14	1.17	5	
		e"	16.6200	Conductivity ( $\sigma$ ):	6.28	6.42	-2.09	5	
	Head 7000	e'	34.3700	Relative Permittivity ( $\epsilon_r$ ):	34.37	33.90	1.39	5	
		e"	16.3800	Conductivity ( $\sigma$ ):	6.38	6.65	-4.13	5	
	10/11/2022	Head 7000	e'	33.6200	Relative Permittivity ( $\epsilon_r$ ):	33.62	33.90	-0.83	5
			e"	17.2500	Conductivity ( $\sigma$ ):	6.71	6.65	0.96	5
Head 7250		e'	33.1900	Relative Permittivity ( $\epsilon_r$ ):	33.19	33.60	-1.22	5	
		e"	17.3800	Conductivity ( $\sigma$ ):	7.01	6.95	0.88	5	
Head 7500		e'	32.8500	Relative Permittivity ( $\epsilon_r$ ):	32.85	33.30	-1.35	5	
		e"	17.4300	Conductivity ( $\sigma$ ):	7.27	7.24	0.40	5	
Head 7800		e'	32.3400	Relative Permittivity ( $\epsilon_r$ ):	32.34	32.94	-1.82	5	
		e"	17.5100	Conductivity ( $\sigma$ ):	7.59	7.60	-0.08	5	
Head 8000		e'	32.1300	Relative Permittivity ( $\epsilon_r$ ):	32.13	32.70	-1.74	5	
		e"	17.5900	Conductivity ( $\sigma$ ):	7.82	7.84	-0.20	5	
Head 8100		e'	31.9200	Relative Permittivity ( $\epsilon_r$ ):	31.92	32.58	-2.03	5	
		e"	17.6700	Conductivity ( $\sigma$ ):	7.96	7.96	-0.07	5	
10/17/2022		Head 6000	e'	35.9200	Relative Permittivity ( $\epsilon_r$ ):	35.92	35.10	2.34	5
			e"	16.0700	Conductivity ( $\sigma$ ):	5.36	5.48	-2.17	5
	Head 6200	e'	35.4900	Relative Permittivity ( $\epsilon_r$ ):	35.49	34.86	1.81	5	
		e"	16.4000	Conductivity ( $\sigma$ ):	5.65	5.72	-1.09	5	
	Head 6500	e'	34.9700	Relative Permittivity ( $\epsilon_r$ ):	34.97	34.50	1.36	5	
		e"	16.7200	Conductivity ( $\sigma$ ):	6.04	6.07	-0.45	5	
	Head 6600	e'	34.8100	Relative Permittivity ( $\epsilon_r$ ):	34.81	34.38	1.25	5	
		e"	16.7900	Conductivity ( $\sigma$ ):	6.16	6.19	-0.39	5	
	Head 6800	e'	34.4500	Relative Permittivity ( $\epsilon_r$ ):	34.45	34.14	0.91	5	
		e"	16.9500	Conductivity ( $\sigma$ ):	6.41	6.42	-0.14	5	
	Head 7000	e'	34.1800	Relative Permittivity ( $\epsilon_r$ ):	34.18	33.90	0.83	5	
		e"	17.0600	Conductivity ( $\sigma$ ):	6.64	6.65	-0.15	5	

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)		
10/20/2022	Head 6000	e'	34.4600	Relative Permittivity ( $\epsilon_r$ ):	34.46	35.10	-1.82	5	
		e"	15.9400	Conductivity ( $\sigma$ ):	5.32	5.48	-2.96	5	
	Head 6200	e'	34.1400	Relative Permittivity ( $\epsilon_r$ ):	34.14	34.86	-2.07	5	
		e"	16.1600	Conductivity ( $\sigma$ ):	5.57	5.72	-2.54	5	
	Head 6500	e'	33.7100	Relative Permittivity ( $\epsilon_r$ ):	33.71	34.50	-2.29	5	
		e"	16.4400	Conductivity ( $\sigma$ ):	5.94	6.07	-2.11	5	
	Head 6600	e'	33.5400	Relative Permittivity ( $\epsilon_r$ ):	33.54	34.38	-2.44	5	
		e"	16.5300	Conductivity ( $\sigma$ ):	6.07	6.19	-1.94	5	
	Head 6800	e'	33.2400	Relative Permittivity ( $\epsilon_r$ ):	33.24	34.14	-2.64	5	
		e"	16.6800	Conductivity ( $\sigma$ ):	6.31	6.42	-1.73	5	
	Head 7000	e'	32.9200	Relative Permittivity ( $\epsilon_r$ ):	32.92	33.90	-2.89	5	
		e"	16.8300	Conductivity ( $\sigma$ ):	6.55	6.65	-1.49	5	
	11/7/2022	Head 6000	e'	36.1300	Relative Permittivity ( $\epsilon_r$ ):	36.13	35.10	2.93	5
			e"	15.9500	Conductivity ( $\sigma$ ):	5.32	5.48	-2.90	5
Head 6200		e'	35.7600	Relative Permittivity ( $\epsilon_r$ ):	35.76	34.86	2.58	5	
		e"	16.2000	Conductivity ( $\sigma$ ):	5.58	5.72	-2.30	5	
Head 6500		e'	35.2600	Relative Permittivity ( $\epsilon_r$ ):	35.26	34.50	2.20	5	
		e"	16.4700	Conductivity ( $\sigma$ ):	5.95	6.07	-1.93	5	
Head 6600		e'	35.0800	Relative Permittivity ( $\epsilon_r$ ):	35.08	34.38	2.04	5	
		e"	16.5900	Conductivity ( $\sigma$ ):	6.09	6.19	-1.58	5	
Head 6800		e'	34.7300	Relative Permittivity ( $\epsilon_r$ ):	34.73	34.14	1.73	5	
		e"	16.7400	Conductivity ( $\sigma$ ):	6.33	6.42	-1.38	5	
Head 7000		e'	34.4400	Relative Permittivity ( $\epsilon_r$ ):	34.44	33.90	1.59	5	
		e"	16.8600	Conductivity ( $\sigma$ ):	6.56	6.65	-1.32	5	

## 8.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every days.

### System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 10.0 cm for measurements > 6 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 5 mm (above 6GHz) from dipole center to the simulating liquid surface.
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

### Reference Target SAR Values

The reference SAR values can be obtained from the calibration certificate of system validation dipoles.

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)	
				1g/10g	Head
D6.5GHzV2	1010	5/27/2023	6500	1g	285.00
				10g	52.90
D8GHzV2	1008	6/10/2023	8000	1g	267.00
				10g	45.00

### System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

### SAR 7 Room

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.	
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W				
10/11/2022	D8GHzV2	1008	Head	1g	27.10	271.0	267.00	1.50	1
				10g	4.79	47.9	45.00	6.44	
10/11/2022	D6.5G V2	1010	Head	1g	29.10	291.0	285.00	2.11	
				10g	5.71	57.1	52.90	7.94	
10/17/2022	D6.5G V2	1010	Head	1g	29.80	298.0	285.00	4.56	
				10g	5.77	57.7	52.90	9.07	
10/20/2022	D6.5G V2	1010	Head	1g	27.30	273.0	285.00	-4.21	
				10g	5.19	51.9	52.90	-1.89	
11/7/2022	D6.5G V2	1010	Head	1g	26.50	265.0	285.00	-7.02	2
				10g	5.18	51.8	52.90	-2.08	

## 9. IPD(Incident Power Density) System with Dielectric Property

### 9.1. Dielectric Property

Media is air so Relative Permittivity ( $\epsilon_r$ ) and Conductivity ( $\sigma$ ) is 1.

### 9.2. System Check

Per Nov 2017,TCB Workshop

System validation is required before a system is deployed for measurement

System check is also required before each series of continuous measurement and, as applicable, repeated at least weekly

Peak and spatially averaged power density at the peak location(s) must be compared to calibrated results according to the defined test conditions

- the same spatial resolution and measurement region used in the waveguide calibration should be applied to system validation and system check
- 4 cm<sup>2</sup> spatial averaging have been used according to FCC requirement.
- power density distribution should also be verified, both spatially (shape) and numerically (level) through visual inspection for noticeable differences
- The Horn antenna input power (forward power) was 86.1mW.
- The measured results should be within 10% of the calibrated targets

#### Reference Target PD Values

Per the manufacturer's guide, the target value of the calibration report was converted to a value of 100mW input power.

5G verification Source	Serial No.	Cal. Date	Freq. (MHz)	Averaging area	Prad (mW)	Input power (dBm)	Target PD Values (W/m <sup>2</sup> )		Note
							1 cm <sup>2</sup>	4 cm <sup>2</sup>	
10GHz	1022	3-1-2022	10000	Circular	86.1	19.35	59.60	54.80	Cal.report target / Probe SN:9536
10GHz	1022	3-1-2022	10000	Circular	86.1	19.35	55.10	51.30	Cal.report target Probe SN:9493

#### SAR 8 Room

Date	Source SN	Source Cal. Due Data	Input Power (mW)	Measured Results for 1cm <sup>2</sup> (W/m <sup>2</sup> )	Target (Ref. Value) (W/m <sup>2</sup> )	Delta $\pm 10\%$	Measured Total psPD for 4cm <sup>2</sup> (W/m <sup>2</sup> )	Target (Ref. Value) (W/m <sup>2</sup> )	Delta $\pm 10\%$	visual inspection	Plot No.
10/13/2022	1022	3/1/2023	86.1	54.20	59.60	-9.06	50.40	54.8	-8.03	confirmed	3
10/14/2022	1022	3/1/2023	86.1	55.00	59.60	-7.72	50.80	54.8	-7.30	confirmed	
10/15/2022	1022	3/1/2023	86.1	54.50	59.60	-8.56	50.50	54.8	-7.85	confirmed	
10/20/2022	1022	3/1/2023	86.1	60.40	59.60	1.34	55.70	54.8	1.64	confirmed	
10/21/2022	1022	3/1/2023	86.1	59.20	59.60	-0.67	53.10	54.8	-3.10	confirmed	4
10/22/2022	1022	3/1/2023	86.1	55.90	59.60	-6.21	51.30	54.8	-6.39	confirmed	
10/24/2022	1022	3/1/2023	86.1	64.40	59.60	8.05	58.50	54.8	6.75	confirmed	
10/25/2022	1022	3/1/2023	86.1	59.90	59.60	0.50	55.30	54.8	0.91	confirmed	

#### SAR 9 Room

Date	Source SN	Source Cal. Due Data	Input Power (mW)	Measured Results for 1cm <sup>2</sup> (W/m <sup>2</sup> )	Target (Ref. Value) (W/m <sup>2</sup> )	Delta $\pm 10\%$	Measured Total psPD for 4cm <sup>2</sup> (W/m <sup>2</sup> )	Target (Ref. Value) (W/m <sup>2</sup> )	Delta $\pm 10\%$	visual inspection	Plot No.
10/12/2022	1022	3/1/2023	86.1	60.20	55.10	9.26	55.30	51.3	7.80	confirmed	5

#### Note(s):

psPD value used the ps<sub>tot</sub> avg value of test result plot.

### 9.3. Wi-Fi 6 GHz (U-NII Bands)

#### Indoor AP

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max. Average Power				SAR Test (Yes/No)
					WLAN MIMO Ant.1		WLAN MIMO Ant.2		
					Avg Pwr (dBm)	Max. Tune-up Limit (dBm)	Avg Pwr (dBm)	Max. Tune-up Limit (dBm)	
UNII 5 (5.925 - 6.425 GHz)	802.11a	6 Mbps	Not Required		9.00	Not Required	9.00	No	
	802.11ax (HE20)	7.3 Mbps	Not Required		9.00	Not Required	9.00	No	
	802.11ax (HE40)	14.6 Mbps	3	5965	8.15	9.00	8.09	9.00	No
			43	6165	8.25		8.72		
			91	6405	8.08		8.40		
802.11ax (HE80)	36.0 Mbps	Not Required		9.00	Not Required	9.00	No		
802.11ax (HE160)	72.0 Mbps	15	6025	7.30	9.00	8.84	9.00	No	
		47	6185	8.78		8.66			
		79	6345	7.80		8.15			
UNII 6 (6.425 - 6.825 GHz)	802.11a	6 Mbps	Not Required		9.00	Not Required	9.00	No	
	802.11ax (HE20)	7.3 Mbps	Not Required		9.00	Not Required	9.00	No	
	802.11ax (HE40)	14.6 Mbps	Not Required		9.00	Not Required	9.00	No	
	802.11ax (HE80)	36.0 Mbps	Not Required		9.00	Not Required	9.00	No	
	802.11ax (HE160)	72.0 Mbps	111	6505	7.76	9.00	8.36	9.00	No
UNII 7 (6.525 - 6.885 GHz)	802.11a	6 Mbps	Not Required		9.00	Not Required	9.00	No	
	802.11ax (HE20)	7.3 Mbps	Not Required		9.00	Not Required	9.00	No	
	802.11ax (HE40)	14.6 Mbps	123	6565	8.20	9.00	8.22	9.00	No
			147	6685	7.84		8.60		
			179	6845	8.22		8.03		
802.11ax (HE80)	36.0 Mbps	Not Required		9.00	Not Required	9.00	No		
802.11ax (HE160)	72.0 Mbps	143	6665	8.48	9.00	8.89	9.00	No	
		175	6825	8.66		8.52			
UNII 8 (6.885 - 7.125 GHz)	802.11a	6 Mbps	Not Required		9.00	Not Required	9.00	No	
	802.11ax (HE20)	7.3 Mbps	Not Required		9.00	Not Required	9.00	No	
	802.11ax (HE40)	14.6 Mbps	Not Required		9.00	Not Required	9.00	No	
	802.11ax (HE80)	36.0 Mbps	Not Required		9.00	Not Required	9.00	No	
	802.11ax (HE160)	72.0 Mbps	207	6985	8.50	9.00	8.11	9.00	No

#### Standard AP

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max. Average Power				SAR Test (Yes/No)	Ch #	Reduced. Average Power				SAR Test (Yes/No)
					WLAN MIMO Ant.1		WLAN MIMO Ant.2				WLAN MIMO Ant.1		WLAN MIMO Ant.2		
					Avg Pwr (dBm)	Max. Tune-up Limit (dBm)	Avg Pwr (dBm)	Max. Tune-up Limit (dBm)			Avg Pwr (dBm)	Max. Tune-up Limit (dBm)	Avg Pwr (dBm)	Max. Tune-up Limit (dBm)	
UNII 5 (5.925 - 6.425 GHz)	802.11a	6 Mbps	1	5955	11.39	11.01	12.00	11.01	12.00	No	1				No
			45	6175	11.66	11.52		11.52			10.00	10.00			
			91	6415	11.40	11.20		11.20							
	802.11ax (HE20)	7.3 Mbps	1	5935	10.71	10.94	12.00	10.94	12.00	No	1				No
			45	6175	11.16	11.35		11.35			10.00	10.00			
			93	6415	10.88	10.99		10.99							
	802.11ax (HE40)	14.6 Mbps	3	5965	11.24	11.60	12.00	11.60	12.00	Yes	3				No
			43	6165	11.78	11.98		11.98			10.00	10.00			
			91	6405	11.38	11.76		11.76							
	802.11ax (HE80)	36.0 Mbps	7	5985	10.08	10.40	11.00	10.40	11.00	No	7				No
39			6145	10.40	10.44	10.44		10.00			10.00				
87			6385	10.35	10.19	10.19									
802.11ax (HE160)	72.0 Mbps	15	6025	10.80	10.81	11.00	10.81	11.00	No	15	8.76	9.45	9.45	Yes	
		47	6185	10.56	10.71		10.71			10.00	9.36				
		79	6345	10.90	10.39		10.39			10.00	9.85				
UNII 7 (6.525 - 6.885 GHz)	802.11a	6 Mbps	117	6535	11.33	11.09	12.00	11.09	12.00	No	117				No
			149	6695	11.34	11.45		11.45			10.00	10.00			
			185	6875	11.41	10.97		10.97							
	802.11ax (HE20)	7.3 Mbps	117	6535	10.73	10.98	12.00	10.98	12.00	No	117				No
			149	6695	11.11	11.01		11.01			10.00	10.00			
			185	6875	10.53	11.17		11.17							
	802.11ax (HE40)	14.6 Mbps	123	6565	11.18	11.97	12.00	11.97	12.00	Yes	123				No
			147	6685	11.60	11.50		11.50			10.00	10.00			
			179	6845	11.15	11.66		11.66							
	802.11ax (HE80)	36.0 Mbps	119	6545	7.85	9.00	11.00	9.00	11.00	No	119				No
151			6705	10.45	10.34	10.34		10.00			10.00				
183			6865	8.08	7.62	7.62		10.00			10.00				
802.11ax (HE160)	72.0 Mbps	143	6665	10.35	10.36	11.00	10.36	11.00	No	143	8.33	9.80	9.80	Yes	
		175	6825	8.66	9.00		9.00			10.00	9.32				

#### Note(s):

Per TCB workshop April.2021's guide, SAR Test should be evaluated at least 5 channels in UNII 6-7GHz. For each Head, Body-worn and Product Specific 10-g, We evaluated SAR test of each 7 channels in UNII 6-7GHz.

## 10. SAR and APD(Absorbed Power Density) Results

### SAR Test Reduction criteria are as follows:

- Reported SAR(W/kg) for Wi-Fi = Measured SAR \* Tune-up scaling factor \* Duty Cycle scaling factor
- Duty Cycle scaling factor = 1 / Duty cycle (%)

### KDB 447498 D01 General RF Exposure Guidance:

Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- $\leq 0.8$  W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\leq 100$  MHz
- $\leq 0.6$  W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- $\leq 0.4$  W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\geq 200$  MHz

### KDB 648474 D04 Handset SAR:

With headset attached, when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is  $> 1.2$  W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

### KDB 648474 D04 Handset SAR (Phablet Only):

For smart phones, with a display diagonal dimension  $> 15.0$  cm or an overall diagonal dimension  $> 16.0$  cm.

When hotspot mode does not apply, 10-g extremity SAR is required for all surfaces and edges with an antenna located at  $\leq 25$ mm from that surface or edge in direct contact with a flat phantom, to address interactive hand use exposure conditions. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR  $> 1.2$  W/kg; However, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold.

Additional 1-g SAR testing at 5 mm is not required when hotspot mode 10-g extremity SAR is not required for the surfaces and edges; since all 1-g reported SAR  $< 1.2$  W/kg.

### 10.1. WiFi (UNII Bands-Above 6GHz)

#### SAR test results

Antenna	RF Exposure Conditions	Mode	PWR Back-off	Dist. (mm)	Test Position	Ch #	Freq. (MHz)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
WLAN MIMO Ant.1	Head	802.11ax HE160 72.0 Mbps	On	0	Left Touch	79	6345.0	99.65%	10.00	9.48	0.032	0.036			
					Left Tilt	79	6345.0	99.65%	10.00	9.48	0.033	0.037			
					Right Touch	15	6025.0	99.65%	10.00	8.76	0.038	0.051			
						47	6185.0	99.65%	10.00	9.41					
						79	6345.0	99.65%	10.00	9.48	0.054	0.061			
						111	6505.0	99.65%	9.00	7.76	0.043	0.057			
						143	6665.0	99.65%	10.00	8.33	0.059	0.087		1	
						175	6825.0	99.65%	10.00	9.25	0.051	0.061			
					207	6985.0	99.65%	9.00	8.50	0.050	0.056				
	Right Tilt	79	6345.0	99.65%	10.00	9.48	0.052	0.059							
	Body-worn	802.11ax HE40 14.6 Mbps	Off	15	Rear	43	6165.0	99.67%	12.00	11.78	0.017	0.018			
						91	6405.0	99.67%	12.00	11.38	0.031	0.036			
						123	6565.0	99.67%	12.00	11.18	0.045	0.055			
						147	6685.0	99.67%	12.00	11.60	0.071	0.078			
						179	6845.0	99.67%	12.00	11.15	0.120	0.146		2	
		Front	43	6165.0	99.67%	12.00	11.78	0.012	0.013						
	802.11ax HE160 72.0 Mbps	Off	15	Rear	111	6505	99.65%	9.00	7.76	0.024	0.032				
					207	6985	99.65%	9.00	8.50	0.079	0.089				
	Product Specific 10-g	802.11ax HE40 14.6 Mbps	Off	0	Rear	43	6165.0	99.67%	12.00	11.78			0.086	0.091	
					Front	43	6165.0	99.67%	12.00	11.78			0.052	0.055	
					Edge 1	43	6165.0	99.67%	12.00	11.78			0.041	0.043	
Edge 2					43	6165.0	99.67%	12.00	11.78						
Edge 4					43	6165.0	99.67%	12.00	11.78			0.095	0.100		
					91	6405.0	99.67%	12.00	11.38			0.092	0.106		
					123	6565.0	99.67%	12.00	11.18			0.122	0.148		
					147	6685.0	99.67%	12.00	11.60			0.143	0.157		
179					6845.0	99.67%	12.00	11.15			0.178	0.217	3		
Edge 4					111	6505	99.65%	9.00	7.76			0.054	0.072		
	207	6985	99.65%	9.00	8.50			0.090	0.101						
WLAN MIMO Ant.2	Head	802.11ax HE160 72.0 Mbps	On	0	Left Touch	79	6345.0	99.65%	10.00	9.85					
					Left Tilt	79	6345.0	99.65%	10.00	9.85					
					Right Touch	15	6025.0	99.65%	10.00	9.45					
						47	6185.0	99.65%	10.00	9.36	0.021	0.024			
						79	6345.0	99.65%	10.00	9.85					
						111	6505.0	99.52%	9.00	8.36					
						143	6665.0	99.65%	10.00	9.80					
						175	6825.0	99.65%	10.00	9.32					
					207	6985.0	99.52%	9.00	8.11						
	Right Tilt	79	6345.0	99.65%	10.00	9.85									
	Body-worn	802.11ax HE40 14.6 Mbps	Off	15	Rear	43	6165.0	99.67%	12.00	11.98					
						91	6405.0	99.67%	12.00	11.76					
						123	6565.0	99.67%	12.00	11.97					
						147	6685.0	99.67%	12.00	11.50					
						179	6845.0	99.67%	12.00	11.66					
		Front	43	6165.0	99.67%	12.00	11.98								
	802.11ax HE160 72.0 Mbps	Off	15	Rear	111	6505	99.65%	9.00	8.36						
					207	6985	99.65%	9.00	8.11						
	Product Specific 10-g	802.11ax HE40 14.6 Mbps	Off	0	Rear	43	6165.0	99.67%	12.00	11.98					
					Front	43	6165.0	99.67%	12.00	11.98					
					Edge 1	43	6165.0	99.67%	12.00	11.98					
Edge 2					43	6165.0	99.67%	12.00	11.98			0.068	0.069		
Edge 4					43	6165.0	99.67%	12.00	11.98						
					91	6405.0	99.67%	12.00	11.76						
					123	6565.0	99.67%	12.00	11.97						
					147	6685.0	99.67%	12.00	11.50						
179					6845.0	99.67%	12.00	11.66							
Edge 4					111	6505	99.65%	9.00	8.36						
	207	6985	99.65%	9.00	8.11										

**APD (Absorbed Power Density) results**

Antenna	RF Exposure Conditions	Mode	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle (%)	Power (dBm)		Measured APD (mW/cm <sup>2</sup> over 4cm <sup>2</sup> )	Plot No.
									Tune-up limit	Meas.		
WLAN MIMO Ant.1	Head	802.11ax HE160 72.0 Mbps	On	0	Left Touch	79	6345.0	99.65%	10.00	9.48	0.0209	
					Left Tilt	79	6345.0	99.65%	10.00	9.48	0.0218	
					Right Touch	15	6025.0	99.65%	10.00	8.76	0.0266	
						47	6185.0	99.65%	10.00	9.41		
						79	6345.0	99.65%	10.00	9.48	0.0356	
						111	6505.0	99.65%	9.00	7.76	0.0206	
						143	6665.0	99.65%	10.00	8.33	0.0391	1
						175	6825.0	99.65%	10.00	9.25	0.0333	
					207	6985.0	99.65%	9.00	8.50	0.0331		
	Right Tilt	79	6345.0	99.65%	10.00	9.48	0.0341					
	Body-worn	802.11ax HE40 14.6 Mbps	Off	15	Rear	43	6165.0	99.67%	12.00	11.78	0.0149	
						91	6405.0	99.67%	12.00	11.38	0.0280	
						123	6565.0	99.67%	12.00	11.18	0.0380	
						147	6685.0	99.67%	12.00	11.60	0.0557	
		Front			43	6165.0	99.67%	12.00	11.78	0.0977	2	
		Rear			111	6505	99.65%	9.00	7.76	0.0214		
	802.11ax HE160 72.0 Mbps	207	6985	99.65%	9.00	8.50	0.0641					
	Product Specific 10-g	802.11ax HE40 14.6 Mbps	Off	0	Rear	43	6165.0	99.67%	12.00	11.78	0.2040	
					Front	43	6165.0	99.67%	12.00	11.78	0.1210	
					Edge 1	43	6165.0	99.67%	12.00	11.78	0.0965	
					Edge 2	43	6165.0	99.67%	12.00	11.78		
Edge 4					43	6165.0	99.67%	12.00	11.78	0.2310		
					91	6405.0	99.67%	12.00	11.38	0.2210		
					123	6565.0	99.67%	12.00	11.18	0.2930		
					147	6685.0	99.67%	12.00	11.60	0.3450		
179					6845.0	99.67%	12.00	11.15	0.4330	3		
Edge 4					111	6505	99.65%	9.00	7.76	0.1290		
207	6985	99.65%	9.00	8.50	0.2140							
WLAN MIMO Ant.2	Head	802.11ax HE160 72.0 Mbps	On	0	Left Touch	79	6345.0	99.65%	10.00	9.85		
					Left Tilt	79	6345.0	99.65%	10.00	9.85		
					Right Touch	15	6025.0	99.65%	10.00	9.45		
						47	6185.0	99.65%	10.00	9.36	0.0148	
						79	6345.0	99.65%	10.00	9.85		
						111	6505.0	99.65%	9.00	8.36		
						143	6665.0	99.65%	10.00	9.80		
						175	6825.0	99.65%	10.00	9.32		
					207	6985.0	99.65%	9.00	8.11			
	Right Tilt	79	6345.0	99.65%	10.00	9.85						
	Body-worn	802.11ax HE40 14.6 Mbps	Off	15	Rear	43	6165.0	99.67%	12.00	11.98		
						91	6405.0	99.67%	12.00	11.76		
						123	6565.0	99.67%	12.00	11.97		
						147	6685.0	99.67%	12.00	11.50		
		Front			43	6165.0	99.67%	12.00	11.66			
		Rear			111	6505	99.65%	9.00	8.36			
	802.11ax HE160 72.0 Mbps	207	6985	99.65%	9.00	8.11						
	Product Specific 10-g	802.11ax HE40 14.6 Mbps	Off	0	Rear	43	6165.0	99.67%	12.00	11.98		
					Front	43	6165.0	99.67%	12.00	11.98		
					Edge 1	43	6165.0	99.67%	12.00	11.98		
					Edge 2	43	6165.0	99.67%	12.00	11.98	0.1650	
Edge 4					43	6165.0	99.67%	12.00	11.98			
					91	6405.0	99.67%	12.00	11.76			
					123	6565.0	99.67%	12.00	11.97			
					147	6685.0	99.67%	12.00	11.50			
179					6845.0	99.67%	12.00	11.66				
Edge 4					111	6505	99.65%	9.00	8.36			
207	6985	99.65%	9.00	8.11								

**Note(s):**

1. APD (Absorbed Power Density) over 4cm<sup>2</sup> averaging area is reported based on SAR measurements.
2. 10 W/m<sup>2</sup> = 1.0 mW/cm<sup>2</sup>



**10.2. UWB****SAR test results**

Antenna	RF Exposure Conditions	Mode	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	10-g SAR (W/kg)	Plot No.
								Meas.	
UWB Ant.1	Product Specific 10-g	CW	N/A	0	Rear	5	6489.6	0.000	
						9	7987.2	0.000	
					Front	5	6489.6	0.000	
						9	7987.2	0.000	
					Edge 4	5	6489.6	0.000	
						9	7987.2	0.000	
UWB Ant.2	Product Specific 10-g	CW	N/A	0	Rear	9	7987.2	0.002	5
					Front	9	7987.2	0.002	
					Edge 1	9	7987.2	0.000	
					Edge 4	9	7987.2	0.000	

**Note(s):**

UWB Ant.1 has support to Ch.5 and Ch.9 and UWB Ant.2 has only support to Ch.9.

**APD (Absorbed Power Density) results**

Antenna	RF Exposure Conditions	Mode	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Measured APD	Plot No.
								(mW/cm <sup>2</sup> over 4cm <sup>2</sup> )	
UWB Ant.1	Product Specific 10-g	CW	N/A	0	Rear	5	6489.6	0.0018	
						9	7987.2	0.0017	
					Front	5	6489.6	0.0012	
						9	7987.2	0.0022	
					Edge 4	5	6489.6	0.0019	
						9	7987.2	0.0018	
UWB Ant.2	Product Specific 10-g	CW	N/A	0	Rear	9	7987.2	0.0041	5
					Front	9	7987.2	0.0037	
					Edge 1	9	7987.2	0.0023	
					Edge 4	9	7987.2	0.0017	

**Note(s):**

- APD (Absorbed Power Density) over 4cm<sup>2</sup> averaging area is reported based on SAR measurements.
- 10 W/m<sup>2</sup> = 1.0 mW/cm<sup>2</sup>

# 11. IPD(Incident Power density) Results

## 11.1. WiFi (UNII Bands-Above 6GHz)

Antenna	Mode	Test Position	Dist. (mm)	Ch.	Freq. (MHz)	Duty Cycle	Grid Step (Lamda)	iPD <sup>Note.1</sup> (mW/cm <sup>2</sup> )	Power (dBm)		Measured. Normal psPD	Measured. Total psPD	Reported. Normal psPD <sup>Note.3</sup>	Reported. Total psPD <sup>Note.3</sup>	Scaling factor for Measurement Uncertainty per IEC 62479 <sup>Note.2</sup>	Scaled Normal psPD	Scaled Total psPD	Note.	Plot No.	
									Tune-up limit	Meas.	mW/cm <sup>2</sup>	mW/cm <sup>2</sup>	mW/cm <sup>2</sup>	mW/cm <sup>2</sup>		mW/cm <sup>2</sup>	mW/cm <sup>2</sup>			
									WLAN MIMO Ant.1 & Ant.2	802.11ax HE 40	Rear	2.00	43	6165.0		99.7%	0.05			0.0585
91	6405.0	99.7%	0.05	N/A	15.00	14.58	0.0873	0.1210					0.0961	0.1340	1.541	0.1481	0.2065			
123	6565.0	99.7%	0.05	N/A	15.00	14.60	0.1080	0.1350					0.1180	0.1480	1.541	0.1818	0.2281			
147	6685.0	99.7%	0.05	N/A	15.00	14.56	0.0848	0.1310					0.0938	0.1440	1.541	0.1445	0.2219			
179	6845.0	99.7%	0.05	N/A	15.00	14.42	0.2150	0.2480					0.2460	0.2830	1.541	0.3791	0.4361	6		
Front	43	6165.0	99.7%	0.05	N/A	15.00	14.89	0.0647			0.0710		0.0663	0.0728	1.541	0.1022	0.1122			
	Edge 1	43	6165.0	99.7%	0.05	N/A	15.00	14.89			0.0521		0.0567	0.0535	0.0582	1.541	0.0824	0.0897		
	Edge 2	43	6165.0	99.7%	0.05	N/A	15.00	14.89			0.0581		0.0722	0.0596	0.0741	1.541	0.0918	0.1142		
	Edge 4	43	6165.0	99.7%	0.05	N/A	15.00	14.89			0.0382		0.0494	0.0392	0.0506	1.541	0.0604	0.0780		
	Rear	9.73	43	6165.0	99.7%	0.05	0.0468	15.00			14.89		0.0184	0.0227	0.0189	0.0233	1.541	0.0291	0.0359	4

**Note(s):**

- 10 W/m<sup>2</sup> = 1.0 mW/cm<sup>2</sup>
- Per TCBC workshop guide, Incident power density results were scaled according to IEC 62479:2010 for the portion of the measurement uncertainty > 30%. Total expanded uncertainty of 2.65 dB (84.1%) was used to determine the psPD measurement scaling factor.
- Power density test data were scaled to tune-up limit using measurement system tool.
- Per manufacturer guide, Incident power density was measured at d=2mm and d=Lamda/5mm using the same grid size and grid step size for some frequencies and surfaces. iPD(integrated Power Density) was calculated based on these measurements. Since iPD ratio between the two distance is < 1dB, the grid step was sufficient for determining compliance at d=2mm.

### 11.2. UWB

Antenna	Mode	Test Position	Dist. (mm)	Ch.	Freq. (MHz)	Grid Step (Lamda)	Meas. Normal psPD	Meas. Total psPD	Scaling factor for Measurement Uncertainty per IEC 62479 <i>Note.2</i>	Scaled Normal psPD	Scaled Total psPD	Note.	Plot No.		
							mW/cm ^2	m W/cm ^2		mW/cm ^2	mW/cm ^2				
UWB Ant. 1	CW	Rear	2.00	5	6489.60	0.05	0.0059	0.0062	1.541	0.0091	0.0096				
				9	7987.20	0.05	0.0055	0.0056	1.541	0.0085	0.0086				
		Front		5	6489.60	0.05	0.0026	0.0033	1.541	0.0040	0.0051				
				9	7987.20	0.05	0.0040	0.0043	1.541	0.0062	0.0066				
Edge 4		5		6489.60	0.05	0.0070	0.0078	1.541	0.0108	0.0120		7			
		9		7987.20	0.05	0.0052	0.0054	1.541	0.0080	0.0083					
UWB Ant. 2		CW		Rear	2.00	9	7987.20	0.05	0.0055	0.0063	1.541	0.0085	0.0097		8
						9	7987.20	0.05	0.0036	0.0040	1.541	0.0055	0.0062		
	Edge 1		9	7987.20		0.05	0.0036	0.0039	1.541	0.0055	0.0060				
			9	7987.20		0.05	0.0052	0.0055	1.541	0.0080	0.0085				

**Note(s):**

1. 10 W/m<sup>2</sup> = 1.0 mW/cm<sup>2</sup>
2. Per TCBC workshop guide, Incident power density results were scaled according to IEC 62479:2010 for the portion of the measurement uncertainty > 30%. Total expanded uncertainty of 2.65 dB (84.1%) was used to determine the psPD measurement scaling factor.

### 12. Simultaneous Transmission Analysis

Please refer to section.12 in FCC SAR report S1.

## **Appendixes**

**Refer to separated files for the following appendixes.**

**4790541052-S2 FCC Report Above 6GHz\_App A\_PD Photos & Ant. Locations**

**4790541052-S2 FCC Report Above 6GHz \_App B\_Highest SAR and PD Test Plots**

**4790541052-S2 FCC Report Above 6GHz \_App C\_System Check Plots**

**4790541052-S2 FCC Report Above 6GHz \_App D\_SAR Tissue Ingredients**

**4790541052-S2 FCC Report Above 6GHz \_App E\_Probe Cal. Certificates**

**4790541052-S2 FCC Report Above 6GHz \_App F\_Dipole and Horn antenna Cal. Certificates**

**END OF REPORT**