POWER DENSITY EVALUATION REPORT

FCC 47 CFR § 2.1093

For
Portable Computing Device with WLAN and Bluetooth

FCC ID: C3K2036
Model Name: 2036 Display 2

Report Number: R14932101-S11
Issue Date: 4/10/2024

Prepared for
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ACCREDITED
CERT #0751.06

REVISION HISTORY

Rev.	Date	Revisions	Revised By
V1	3/27/2024	Initial Issue	--
V2	4/5/2024	Updated device description on title page. Updated §6.1 Device Dimensions row to refer to Appendix A, updated sample note, and sw version.	Richard Jankovics
V3	4/5/2024	Updated §2 with PAG KDB 388624 D02 v18r05 Annex OVER6G	Richard Jankovics
V4	4/8/2024	Updated §2 and 7 with PAG KDB 388624 D02 v18r05 Appendix OVER6G	Richard Jankovics
V5	4/10/2024	Updated §2 with IEC/IEEE 63195-1:2022	Richard Jankovics

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1. Attestation of Test Results

Applicant Name	MICROSOFT CORP	
FCC ID	C3K2036	
Model Name	2036 Display 2	
Applicable Standards	FCC 47 CFR § 2.1093	
Exposure Category	Radiofrequency (RF) Radiation Exposure (above 6GHz)	
	Uncontrol (mW/cm^2 over 4 cm^2) 30 min average	Occupational/controlled (mW/cm^2 over 4 cm^2) 6 min average
	1.0	5
Applicable limit	☒ Uncontrol / ☐ Occupational/controlled	
PD Result (mW/cm^2 over 4cm^2)	0.733	
Date Tested	1/22/2024 – 2/28/2024	
Test Results	Pass	

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.
This report contains data provided by the customer which can impact the validity of results. UL LLC is only responsible for the validity of results after the integration of the data provided by the customer.
The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.
This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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 A2LA, NIST, or any agency of the U.S. Government, or any agency of the U.S. government.

Approved & Released By:	Prepared By:
Devin Chang Senior Laboratory Engineer UL Verification Services Inc.	Richard Jankovics Staff Engineer UL LLC

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, the following FCC Published RF exposure KDB procedures:

- 447498 D01 General RF Exposure Guidance v06
- 865664 D02 RF Exposure Reporting v01r02
- SPEAG DASY8 System Handbook; part 4 DASY8 Module mmWave
- SPEAG DASY8 Application Note: SAR, APD & PD at 6 – 10 GHz (Version 5), April 2022
- IEC/IEEE 63195-1:2022
- PAG KDB 388624 D02 v18r05 Appendix OVER6G

In addition to the above, TCB workshop information was used.

- TCB workshop November 2017; RF Exposure Procedures (Power Density Evaluation)
- TCB workshop October 2018; RF Exposure Procedures (Millimeter Wave Assessment)
- TCB workshop April 2019; RF Exposure Procedures (Millimeter Wave RF Exposure Evaluation)
- TCB workshop November 2019; RF Exposure Procedures (Millimeter Wave Scan Requirements)
- TCB workshop October 2020; RF Exposure Procedures (U NII 6-7 GHz RF Exposure)

3. Facilities and Accreditation

UL LLC is accredited by A2LA, cert. # 0751.06 for all testing performed within the scope of this report. Testing was performed at the locations noted below.

The test sites and measurement facilities used to collect data are located at 2800 Perimeter Park Dr, Morrisville, NC, USA.

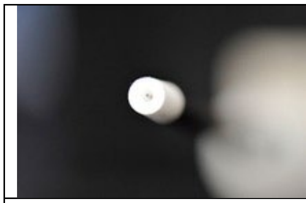
- SAR Lab 1A

	Address	ISED CABID	ISED Company Number	FCC Registration
☐	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	825374
☒	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A	US0067	27265	825374

4. Measurement System & Test Equipment

4.1. EUmmWVx / E-Field 5G Probe

E-Field mm-Wave Probe for General Near-Field Measurements

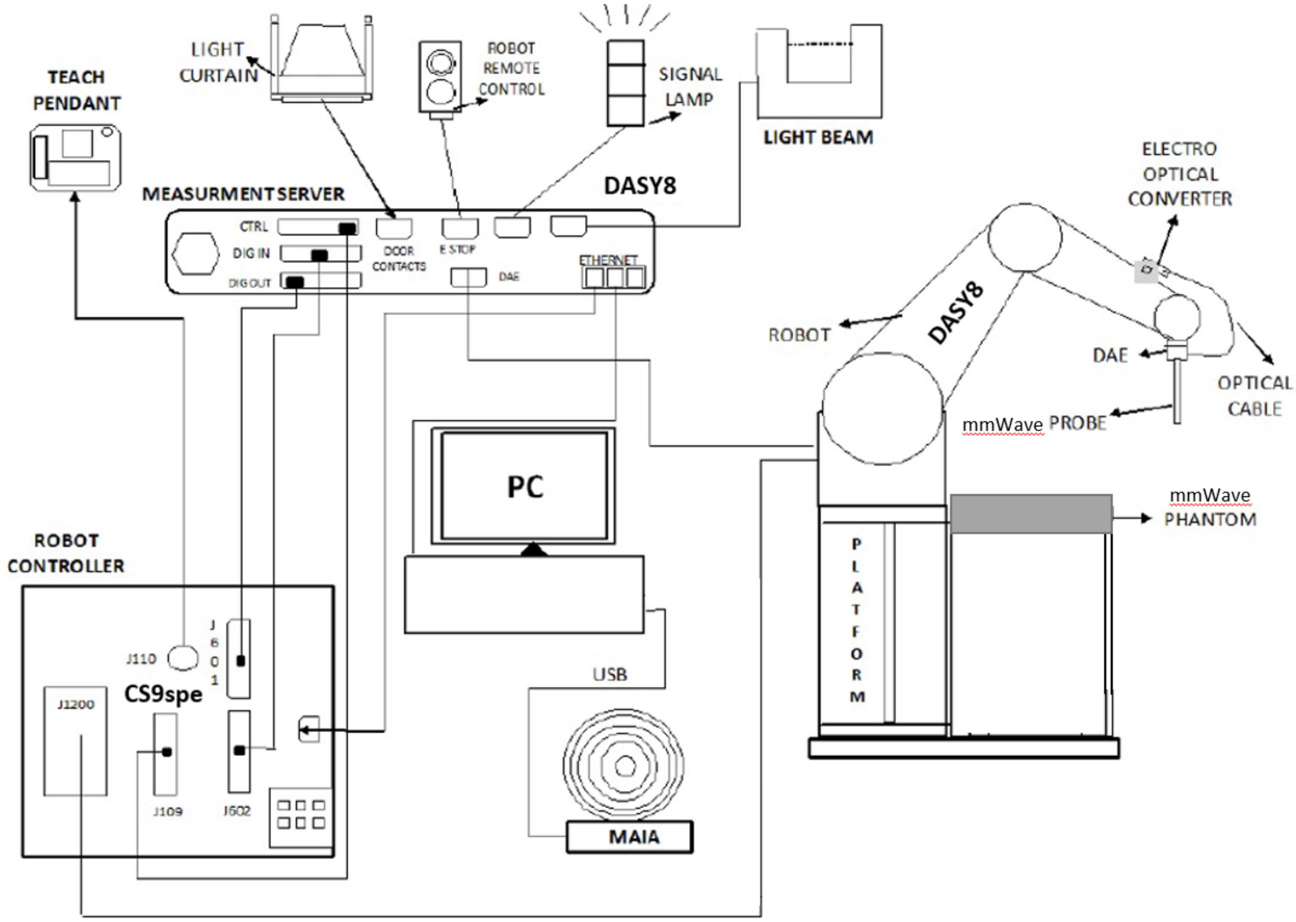
	Two dipoles optimally arranged to obtain pseudo-vector information Minimum 3 measurements/point, 120º rotated around probe axis Sensors (0.8mm length) printed on glass substrate protected by high density foam Low perturbation of the measured field Requires positioner which can do accurate probe rotation
Frequency Range	750 MHz – 110 GHz (EUmmWV4)
Dynamic Range	< 20 V/m - 10'000 V/m with PRE-10 (min < 50 V/m - 3000 V/m)
Position Precision	< 0.2 mm (DASY8)
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: encapsulation 8 mm (internal sensor < 1mm) Distance from probe tip to dipole centers: < 2 mm Sensor displacement to probe's calibration point: < 0.3 mm
Applications	E-field measurements of 5G devices and other mm-wave transmitters operating above 6GHz in < 2 mm distance from device (free-space) Power density, H-field and far-field analysis using total field reconstruction (DASY8 Module mmWave)
Compatibility	DASY8 Module mmWave V3.2.0.1840

4.2. Data Acquisition Electronics(DAE)

	Serial optical link for communication with DASY embedded system (fully remote controlled) Two-step probe touch detector for mechanical surface detection and emergency robsot stop
Measurement Range	−100 – +300 mV (16 bit resolution and two range settings: 4 mV, 400 mV)
Input Offset Voltage	<5 µV (with auto zero)
Input Resistance	200 Mohm
Input Bias Current	<50 fA
Battery Power	>10 hours of operation (with two 9.6 V NiMH batteries)
Dimensions (L × W × H)	60 × 60 × 68 mm

4.3. Measurement System

The DASY8 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 DASY8[1] 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.

[1] DASY8 software used: DASY8 mmWave V3.2.0.1840 and older generations.

4.4. Measurement Procedures

4.4.1. System Verification Scan Procedures

DASY8 Module mmWave supports “5G Scan”, a fine resolution scan performed on two different planes which is used to reconstruct the E- and H-fields as well as the power density; the average power density is derived from this measurement.

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 devise 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 DASY8 System Handbook; part 4 DASY8 Module mmWave.

Recommended settings for measurement of verification sources

Frequency [GHz]	Grid step	Grid extent X/Y [mm]	Measurement points
10	0.125 $\left(\frac{\lambda}{8}\right)$	60/60	18×18
30	0.25 $\left(\frac{\lambda}{4}\right)$	60/60	26×26
45	0.25 $\left(\frac{\lambda}{4}\right)$	42/42	28×28
60	0.25 $\left(\frac{\lambda}{4}\right)$	32.5/32.5	28×28
90	0.25 $\left(\frac{\lambda}{4}\right)$	30/30	38×38

The minimum distance of probe sensors to the verification source surface, horn antenna, is 10 mm for 10 GHz and 5.55mm for 30 GHz and above.

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 ± 5 %, test is repeated from step1.

4.4.2. Scan Procedures

Step 1: Power Reference Measurement
Same as System Verification Scan Procedures step 1.

Step 2: 5G Scan
Same as System Verification Scan Procedures step 2. But measurement area is defined based on TCB work shop April 2019, “A sufficiently large measurement region and proper measurement spatial resolution are required to maintain field reconstruction accuracy”.
–Fields at the measurement region boundary should be ~20-30 dB below the peaks

Step 3: Power drift measurement
Same as System Verification Scan Procedures step 3.
When the drift is smaller than ± 5 %, it is considered in the uncertainty budget if drifts larger than 5%, uncertainty is re-calculated.

4.5. 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.

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Date	Cal. Due Date
Signal Generator	Keysight	83640B	3844A00978	8/2/2023	8/2/2024
Power Meter	Keysight	N1912A	MY55116004	10/30/2023	10/30/2024
Power Sensor	Keysight	N1921A	MY55090023	4/3/2023	4/3/2024
Power Sensor	Keysight	N1921A	MY55090030	6/26/2023	6/26/2024
Directional coupler	Mini-Circuits	ZUDC10-183+	1438	NA	NA

Lab Equipment

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Date	Cal. Due Date
E-Field Probe (SAR1A)	SPEAG	EUmmWV4	9617	1/15/2024	1/15/2025
E-Field Probe (SAR1A)	SPEAG	EUmmWV4	9619	3/17/2023	3/17/2024
Data Acquisition Electronics[1]	SPEAG	DAE4	1715	1/23/2023	1/31/2024
Data Acquisition Electronics	SPEAG	DAE4	1715	2/12/2024	2/12/2025
10 GHz Verification Source[1]	SPEAG	SM 003 120 AA	1040	1/19/2023	1/31/2024
10 GHz Verification Source	SPEAG	SM 003 120 AA	1040	2/23/2024	2/23/2025

Notes:

1. Equipment recalibrated during test program. Testing performed within valid calibration dates.

5. Measurement Uncertainty

a		b	c	d f(d,k)	e	f = b×*e/d*	g
Error Description		Unc.Value (±dB)	Probab. Distri.	Div.	*ci*	Std. Unc. (±dB)	vi
Uncertainty terms dependent on the measurement system							
CAL	Calibration Repeatability	0.49	Normal	1	1	0.49	∞
COR	Probe correction	0	Rectangular	1.732	1	0.00	∞
FRS	Frequency response (BW □1 GHz)	0.20	Rectangular	1.732	1	0.12	∞
SCC	Sensor cross coupling	0	Rectangular	1.732	1	0.00	∞
ISO	Isotropy	0.50	Rectangular	1.732	1	0.29	∞
LIN	Linearity	0.20	Rectangular	1.732	1	0.12	∞
PSC	Probe scattering	0	Rectangular	1.732	1	0.00	∞
PPO	Probe positioning o□set	0.30	Rectangular	1.732	1	0.17	∞
PPR	Probe positioning repeatability	0.04	Rectangular	1.732	1	0.02	∞
SMO	Sensor mechanical o□set	0	Rectangular	1.732	1	0.00	∞
PSR	Probe spatial resolution	0	Rectangular	1.732	1	0.00	∞
FLD	Field impedance dependance	0	Rectangular	1.732	1	0.00	∞
APD	Amplitude and phase drift	0	Rectangular	1.732	1	0.00	∞
APN	Amplitude and phase noise	0.04	Rectangular	1.732	1	0.02	∞
TR	Measurement area truncation	0	Rectangular	1.732	1	0.00	∞
DAQ	Data acquisition	0.03	Normal	1	1	0.03	∞
SMP	Sampling	0	Rectangular	1.732	1	0.00	∞
REC	Field reconstruction	0.60	Rectangular	1.732	1	0.35	∞
TRA	Forward transformation	0	Rectangular	1.732	1	0.00	∞
SCA	Power density scaling	-	Rectangular	1.732	1	-	∞
SAV	Spatial averaging	0.10	Rectangular	1.732	1	0.06	∞
SDL	System detection limit	0.04	Rectangular	1.732	1	0.02	∞
Uncertainty terms dependent on the DUT and environmental factors							
PC	Probe coupling with DUT	0	Rectangular	1.732	1	0	∞
MOD	Modulation response	0.40	Rectangular	1.732	1	0.23	∞
IT	Integration time	0	Rectangular	1.732	1	0	∞
RT	Response time	0	Rectangular	1.732	1	0	∞
DH	Device holder influence	0.10	Rectangular	1.732	1	0.06	∞
DAQ	DUT alignment	0	Rectangular	1.732	1	0	∞
AC	RF ambient conditions	0.04	Rectangular	1.732	1	0.02	∞
AR	Ambient reflections	0.04	Rectangular	1.732	1	0.02	∞
MSI	Immunity / secondary reception	0	Rectangular	1.732	1	0	∞
DRI	Drift of the DUT	0.2	Rectangular	1.732	1	0.12	∞
Combined Standard Uncertainty Uc(f) =			RSS			0.76	∞
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =						1.52	

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Refer to Appendix A for device dimensions and description.
Battery Options	The rechargeable battery is not user accessible.
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☒ Wi-Fi Direct (Wi-Fi 2.4 GHz) ☒ Wi-Fi Direct (Wi-Fi 5 GHz)
Test sample information	**S/N** **Notes** 0F00GQ623383HH 13 Inch Display 1, 6GHz Conducted/Radiated
Hardware Version	EV3
Software Version	1.0.3808.9500

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for PD testing
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20) 802.11n (HT40) 802.11ax (HE20) 802.11ax (HE40) 802.11be (EHT20) 802.11be (EHT40)	N/A
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT80) 802.11ac (VHT160) 802.11ax (HE20) 802.11ax (HE40) 802.11ax (HE80) 802.11ax (HE160) 802.11be (EHT20) 802.11be (EHT40) 802.11be (EHT80) 802.11be (EHT160)	N/A
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No		
	Does this device support Band gap channel(s)? ☒ Yes ☐ No		
	6 GHz	802.11a 802.11ax (HE20) 802.11ax (HE40) 802.11ax (HE80) 802.11ax (HE160) 802.11be (EHT20) 802.11be (EHT40) 802.11be (EHT80) 802.11be (EHT160) 802.11be (EHT320)	99.6% (802.11be 320MHz BW) [2]
Bluetooth	2.4 GHz	BR, EDR, and LE	N/A

Notes:
1. This report only covers the power density evaluation of the 6 GHz Wi-Fi.
2. Duty cycle for Wi-Fi is referenced from the SAR report. (R14932101-S4)

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.

Power density evaluated at worst-surfaces/channel according to test results of R14932101-S4 SAR report. Per PAG KDB 388624 D02 v18r05 Appendix OVER6G, PD testing with the mmWave probe with field reconstruction is performed on the highest SAR test configuration. Testing was performed on the bottom surface for both antenna chains.

8. System Performance 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.
- 1 cm^2 and 4 cm^2 spatial averaging have been recommended in the AHG10 draft TR with reference targets available for specific waveguide.
- power density distribution should also be verified, both spatially (shape) and numerically (level) through visual inspection for noticeable differences.
- the measured results should be within 10% of the calibrated targets.

The system components, software settings and other system parameters shall be the same as those used for the compliance tests. The system check shall be performed at closest probe calibration frequency point as in the compliance tests, e.g., if the EUT operates at 35 GHz, it is recommended to perform the validation at 30 GHz.

SAR Lab	Date	5G Verification Source_SN	Cal. Due Date	Measured Results for W/m^2 over 4 cm^2						Plot No.
				psPDn+ Meas. (W/m^2)	psPDtot+ Meas. (W/m^2)	psPDmod+ Meas. (W/m^2)	psPD Avg Meas. (W/m^2)	Square Avg Target (W/m^2)	Deviation (%)	
1A	1/22/2024	10GHz SN:1040	1/31/2024	54.7	55.1	55.3	55.0	54.0	1.91	1
1A	2/26/2024	10GHz SN:1040	2/13/2025	56.6	56.9	57.3	56.9	56.1	0.89	2

Note(s):
Input power that was used, 19.9 dBm, is same as calibration data (19.35 dBm P_{rad} + 0.55 dB ohmic/mismatch loss).

9. Conducted Output Power Measurements

9.1. Wi-Fi - 6 GHz (U-NII 5-8 Bands)

When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/ax/be modes, the channel in the lower order/sequence 802.11 transmission mode is selected.
The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.

Wi-Fi - 6 GHz Test channels were determined in one of two ways:

- Wi-Fi - 6 GHz was Aggregated due to the same transmission mode being selected for SAR testing. 5 total test channels from across all U-NII 5/6/7/8 were selected.
  Note: 4 test channels were selected due to 320 MHz BW covering entire band with only 4 channels.

- Wi-Fi - 6 GHz was Split due to different transmission modes being selected for SAR testing. A minimum of 3 test channels were selected for each individual U-NII Band.

Maximum Output Power for Wi-Fi - 6 GHz

The table below is the maximum output power for this device. SAR back-off is always triggered (static SAR), with Time-Averaged SAR enabled. The purpose of this report is to demonstrate that the EUT meets FCC PD limits when transmitting in static transmission scenario at maximum allowable time-averaged power levels (SAR back-off power state).

Max-power state – Standard Power (Indoor/Outdoor) – Chain 0/1

Freq. Band	20 MHz & Partial BWs								40 MHz				80 MHz			
			Maximum Output Power (dBm) SISO/MIMO per Chain								Maximum Output Power (dBm) SISO/MIMO per Chain				Maximum Output Power (dBm) SISO/MIMO per Chain	
	Ch #	Center Freq	11a	26T	52T, 52T+26T	106T, 106T+26T	242T	HE20/ EHT20	Ch #	Center Freq	484T, 484T+242T	HE40/ EHT40	Ch #	Center Freq	996T, 996T+484T	HE80/ EHT80
U-NII-5 (5.925 to 6.425 GHz)		5935	18.0	9.5	12.5	14.5	18.0	18.0								
	1	5955	18.0	9.5	12.5	14.5	18.0	18.0	3	5965	19.0	19.0	7	5985	18.0	19.0
	5	5975	18.0	9.5	12.5	14.5	18.0	18.0								
	9	5995	18.0	9.5	12.5	14.5	18.0	18.0	11	6005	19.0	19.0				
	13	6015	18.0	9.5	12.5	14.5	18.0	18.0								
	17	6035	18.0	9.5	12.5	14.5	18.0	18.0	19	6045	19.0	19.0	23	6065	18.0	19.0
	21	6055	18.0	9.5	12.5	14.5	18.0	18.0								
	25	6075	18.0	9.5	12.5	14.5	18.0	18.0	27	6085	19.0	19.0				
	29	6095	18.0	9.5	12.5	14.5	18.0	18.0								
	33	6115	18.0	9.5	12.5	14.5	18.0	18.0	35	6125	19.0	19.0	39	6145	18.0	19.0
	37	6135	18.0	9.5	12.5	14.5	18.0	18.0								
	41	6155	18.0	9.5	12.5	14.5	18.0	18.0	43	6165	19.0	19.0				
	45	6175	18.0	9.5	12.5	14.5	18.0	18.0								
	49	6195	18.0	9.5	12.5	14.5	18.0	18.0	51	6205	19.0	19.0	55	6225	18.0	19.0
	53	6215	18.0	9.5	12.5	14.5	18.0	18.0								
	57	6235	18.0	9.5	12.5	14.5	18.0	18.0	59	6245	19.0	19.0				
	61	6255	18.0	9.5	12.5	14.5	18.0	18.0								
	65	6275	18.0	9.5	12.5	14.5	18.0	18.0	67	6285	19.0	19.0	71	6305	18.0	19.0
	69	6295	18.0	9.5	12.5	14.5	18.0	18.0								
	73	6315	18.0	9.5	12.5	14.5	18.0	18.0	75	6325	19.0	19.0				
	77	6335	18.0	9.5	12.5	14.5	18.0	18.0								
	81	6355	18.0	9.5	12.5	14.5	18.0	18.0	83	6365	19.0	19.0	87	6385	17.0	19.0
	85	6375	18.0	9.5	12.5	14.5	18.0	18.0								
	89	6395	18.0	9.5	12.5	14.5	18.0	18.0	91	6405	18.5	18.5				
	93	6415	18.0	9.5	12.0	13.5	18.0	18.0								
U-NII-7 (6.525 to 6.875 GHz)	117	6535	16.5	8.5	11.0	13.5	17.0	17.0								
	121	6555	17.0	8.5	11.5	13.5	17.0	17.0	123	6565	18.0	18.0				
	125	6575	17.0	8.5	11.5	13.5	17.0	17.0								
	129	6595	17.0	8.5	11.5	13.5	17.0	17.0	131	6605	18.0	18.0	135	6625	15.5	20.0
	133	6615	17.0	8.5	11.5	13.5	17.0	17.0								
	137	6635	17.0	8.5	11.5	13.5	17.0	17.0	139	6645	18.0	18.0				
	141	6655	17.0	8.5	11.5	13.5	17.0	17.0								
	145	6675	17.0	8.5	11.5	13.5	17.0	17.0	147	6685	18.0	18.0	151	6705	15.5	20.0
	149	6695	17.0	8.5	11.5	13.5	17.0	17.0								
	153	6715	17.0	8.5	11.5	13.5	17.0	17.0	155	6725	18.0	18.0				
	157	6735	17.0	8.5	11.5	13.5	17.0	17.0								
	161	6755	17.0	8.5	11.5	13.5	17.0	17.0	163	6765	18.0	18.0	167	6785	15.5	20.0
	165	6775	17.0	8.5	11.5	13.5	17.0	17.0								
	169	6795	17.0	8.5	11.5	13.5	17.0	17.0	171	6805	18.0	18.0				
	173	6815	17.0	8.5	11.5	13.5	17.0	17.0								
	177	6835	17.0	8.5	11.5	13.5	17.0	17.0	179	6845	18.0	18.0				
	181	6855	17.0	8.5	11.5	13.5	17.0	17.0								
	185	6875														

Max-power state – Standard Power (Indoor/Outdoor) (continued) – Chain 0/1

Freq. Band	160 MHz				320 MHz							
			Maximum Output Power (dBm) SISO/MIMO per Chain				Maximum Output Power (dBm) SISO/MIMO per Chain				Maximum Output Power (dBm) SISO/MIMO per chain	
	Ch #	Center Freq	996T*2 996T*2+484T, 996T*3, 996T*3+484T	HE160/ EHT160	Ch #	Center Freq	996T*4	EHT320	Ch #	Center Freq	996T*4	EHT320
U-NII-5 (5.925 to 6.425 GHz)	15	6025	16.0	18.0	32	6106	16.0	16.0				
	47	6185	16.0	18.0					64	6266	16.0	16.0
	79	6345	18.0	18.0								
U-NII-7 (6.525 to 6.875 GHz)	143	6665	16.0	16.0								

Max-power state – Low Power Indoor – Chain 0/1

20 MHz & Partial BWs — Maximum Output Power (dBm) SISO/MIMO per Chain

Freq. Band	Ch #	Center Freq	11a	26T	52T, 52T+26T	106T, 106T+26T	242T	HE20/ EHT20
U-NII-5 (5.925 to 6.425 GHz)		5935	0.5	-8.0	-5.0	-2.0	1.0	1.0
	1	5955	0.5	-8.0	-5.0	-2.0	1.0	1.0
	5	5975	0.5	-8.0	-5.0	-2.0	1.0	1.0
	9	5995	0.5	-8.0	-5.0	-2.0	1.0	1.0
	13	6015	0.5	-8.0	-5.0	-2.0	1.0	1.0
	17	6035	0.5	-8.0	-5.0	-2.0	1.0	1.0
	21	6055	0.5	-8.0	-5.0	-2.0	1.0	1.0
	25	6075	0.5	-8.0	-5.0	-2.0	1.0	1.0
	29	6095	0.5	-8.0	-5.0	-2.0	1.0	1.0
	33	6115	0.5	-8.0	-5.0	-2.0	1.0	1.0
	37	6135	0.5	-8.0	-5.0	-2.0	1.0	1.0
	41	6155	0.5	-8.0	-5.0	-2.0	1.0	1.0
	45	6175	0.5	-8.0	-5.0	-2.0	1.0	1.0
	49	6195	0.5	-8.0	-5.0	-2.0	1.0	1.0
	53	6215	0.5	-8.0	-5.0	-2.0	1.0	1.0
	57	6235	0.5	-8.0	-5.0	-2.0	1.0	1.0
	61	6255	0.5	-8.0	-5.0	-2.0	1.0	1.0
	65	6275	0.5	-8.0	-5.0	-2.0	1.0	1.0
	69	6295	0.5	-8.0	-5.0	-2.0	1.0	1.0
	73	6315	0.5	-8.0	-5.0	-2.0	1.0	1.0
	77	6335	0.5	-8.0	-5.0	-2.0	1.0	1.0
	81	6355	0.5	-8.0	-5.0	-2.0	1.0	1.0
	85	6375	0.5	-8.0	-5.0	-2.0	1.0	1.0
	89	6395	0.5	-8.0	-5.0	-2.0	1.0	1.0
	93	6415	0.5	-8.0	-5.0	-2.0	1.0	1.0
U-NII-6 (6.425 to 6.525 GHz)	97	6435	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	101	6455	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	105	6475	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	109	6495	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	113	6515	-0.5	-9.0	-6.0	-3.0	0.0	0.0
U-NII-7 (6.525 to 6.875 GHz)	117	6535	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	121	6555	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	125	6575	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	129	6595	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	133	6615	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	137	6635	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	141	6655	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	145	6675	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	149	6695	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	153	6715	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	157	6735	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	161	6755	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	165	6775	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	169	6795	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	173	6815	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	177	6835	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	181	6855	-0.5	-9.0	-6.0	-3.0	0.0	0.0
	185	6875	-0.5	-9.0	-6.0	-3.0	0.0	0.0
U-NII-8 (6.875 to 7.125 GHz)	189	6895	1.0	-7.5	-4.5	-1.5	1.5	1.5
	193	6915	1.0	-7.5	-4.5	-1.5	1.5	1.5
	197	6935	1.0	-7.5	-4.5	-1.5	1.5	1.5
	201	6955	1.0	-7.5	-4.5	-1.5	1.5	1.5
	205	6975	1.0	-7.5	-4.5	-1.5	1.5	1.5
	209	6995	1.0	-7.5	-4.5	-1.5	1.5	1.5
	213	7015	1.0	-7.5	-4.5	-1.5	1.5	1.5
	217	7035	1.0	-7.5	-4.5	-1.5	1.5	1.5
	221	7055	1.0	-7.5	-4.5	-1.5	1.5	1.5
	225	7075	1.0	-7.5	-4.5	-1.5	1.5	1.5
	229	7095	1.0	-7.5	-4.5	-1.5	1.5	1.5
	233	7115	1.0	-7.5	-4.5	-1.5	1.5	1.5

40 MHz — Maximum Output Power (dBm) SISO/MIMO per Chain

Ch #	Center Freq	484T, 484T+242T	HE40/ EHT40
3	5965	3.5	3.5
11	6005	3.5	3.5
19	6045	3.5	3.5
27	6085	3.5	3.5
35	6125	3.5	3.5
43	6165	3.5	3.5
51	6205	3.5	3.5
59	6245	3.5	3.5
67	6285	3.5	3.5
75	6325	3.5	3.5
83	6365	3.5	3.5
91	6405	3.5	3.5
99	6445	3.0	3.0
107	6485	3.0	3.0
115	6525	3.0	3.0
123	6565	3.0	3.0
131	6605	3.0	3.0
139	6645	3.0	3.0
147	6685	3.0	3.0
155	6725	3.0	3.0
163	6765	3.0	3.0
171	6805	3.0	3.0
179	6845	3.0	3.0
187	6885	3.0	3.0
195	6925	4.5	4.5
203	6965	4.5	4.5
211	7005	4.5	4.5
219	7045	4.5	4.5
227	7085	4.5	4.5

80 MHz — Maximum Output Power (dBm) SISO/MIMO per Chain

Ch #	Center Freq	996T, 996T+484T	HE80/ EHT80
7	5985	6.5	6.5
23	6065	6.5	6.5
39	6145	6.5	6.5
55	6225	6.5	6.5
71	6305	6.5	6.5
87	6385	6.5	6.5
103	6465	5.0	5.0
119	6545	5.0	5.0
135	6625	5.0	5.0
151	6705	5.0	5.0
167	6785	5.0	5.0
183	6865	5.0	5.0
199	6945	7.5	7.5
215	7025	7.5	7.5

Max-power state – Low Power Indoor (continued) – Chain 0/1

Freq. Band	160 MHz				320 MHz							
			Maximum Output Power (dBm) SISO/MIMO per Chain				Maximum Output Power (dBm) SISO/MIMO per Chain				Maximum Output Power (dBm) SISO/MIMO per chain	
	Ch #	Center Freq	996T*2 996T*2+484T, 996T*3, 996T*3+484T	HE160/ EHT160	Ch #	Center Freq	996T*4	EHT320	Ch #	Center Freq	996T*4	EHT320
U-NII-5 (5.925 to 6.425 GHz)	15	6025	7.5	7.5	31	6105	12.0	12.0				
	47	6185	7.5	7.5					63	6265	12.0	12.0
	79	6345	7.0	7.0	95	6425	10.5	10.5				
U-NII-6 (6.425 to 6.525 GHz)	111	6505	6.0	6.0					127	6585	10.5	10.5
U-NII-7 (6.525 to 6.875 GHz)	143	6665	7.0	7.0	159	6745	10.5	10.5				
	175	6825	7.0	7.0					191	6905	10.5	10.5
U-NII-8 (6.875 to 7.125 GHz)	207	6985	8.5	8.5								

SAR back-off power state – Standard Power (Indoor/Outdoor) / Low Power Indoor – Chain 0/1

SAR back-off power levels are to be used in that state unless Max power state is lower. 6GHz SAR back-off limit is same for SP and LPI.

Frequency Band	6G Channel Groups SP & LPI	BW: 20/40/80/160/320 all ax/be partial		
		Channels	Chain 0 (Left)	Chain 1 (Right)
5.925 to 6.425 GHz	0	1 to 45	10.50	10.50
	1	49 to 93	10.50	10.50
6.425 to 6.525 GHz	2	97 to 113	10.50	10.50
6.525 to 6.875 GHz	3	117 to 185	10.50	10.50
6.875 to 7.125 GHz	4	189 to 233	10.50	10.50

Wi-Fi - 6 GHz Measured Results – SAR back-off power state

Band	Mode	Power State	Ch #	Freq. (MHz)	Chain 0 Average Power (dBm)			Chain 1 Average Power (dBm)		
					Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
6GHz	802.11be (EHT320)	SP / LPI	31	6105	10.04	10.50	Yes	9.18	10.50	Yes
		LPI	95	6425	9.90	10.50		9.84	10.50	
			159	6745	9.70	10.50		10.15	10.50	
			191	6905	9.57	10.50		9.15	10.50	

Note(s):

1. 4 channels chosen instead of aggregated 5 due to coverage of 320 MHz channels.
2. Conducted output power measurements are referenced from UL SAR report R14932101-S4.

10. Measured and Reported (Scaled) Results

Per TCB workshop October 2018, 4 cm^2 averaging area is considered.

1. psPD value (mW/cm^2) used the $psPD_{tot+}$ avg value (W/m^2) of test result plot.

Wi-Fi - 6 GHz Test Rationale:

Power density evaluated at worst-case surface according to test results of R14932101-S4 SAR report. Per TCB workshop October 2020 presentation, PD testing with the mmWave probe is performed on the highest SAR test configuration. Testing was performed on the bottom surface for both antenna chains.

10.1. Wi-Fi - 6 GHz Test Results

SAR back-off power state – Low Power Indoor

Band	Mode	Antenna	Dist. (mm)	Test Position	Freq. (MHz)	Ch #.	Duty Cycle	MU scaling	Power (dBm)		Power Density mW/cm^2 over $4cm^2$ $pS_{tot}avg$ (mW/cm^2)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
6 GHz	802.11be EHT320	Chain 0	2	Bottom	6105	31	99.6%	11.9%	10.50	10.04	0.535	**0.668**	1
6 GHz	802.11be EHT320	Chain 0	2	Bottom	6425	95	99.6%	11.9%	10.50	9.90	0.393	0.507	
6 GHz	802.11be EHT320	Chain 0	2	Bottom	6745	159	99.6%	11.9%	10.50	9.70	0.280	0.378	
6 GHz	802.11be EHT320	Chain 0	2	Bottom	6905	191	99.6%	11.9%	10.50	9.57	0.271	0.377	
6 GHz	802.11be EHT320	Chain 1	2	Bottom	6105	31	99.6%	11.9%	10.50	9.18	0.457	0.696	
6 GHz	802.11be EHT320	Chain 1	2	Bottom	6425	95	99.6%	11.9%	10.50	9.84	0.531	0.695	
6 GHz	802.11be EHT320	Chain 1	2	Bottom	6745	159	99.6%	11.9%	10.50	10.15	0.585	0.712	
6 GHz	802.11be EHT320	Chain 1	2	Bottom	6905	191	99.6%	11.9%	10.50	9.15	0.478	**0.733**	2

Note(s):

1. MU scaling applied due to total uncertainty (1.52 dB, 41.9%) exceeds the 30% budget. Scaling applied for the amount exceeding the 30% budget (11.9%).

11. Simultaneous Transmission Conditions

Simultaneous transmission conditions addressed in UL SAR report R14932101-S4.

Appendices

Refer to separated files for the following appendixes.

Appendix A: Setup Photos

Appendix B: System Check Plots

Appendix C: Highest PD Test Plots

Appendix D: Probe Certificates

Appendix E: Verification source Certificates

END OF REPORT