

TEST REPORT

Report Number: R15566021-E4

Applicant : Microsoft Corporation
1 Microsoft Way
Redmond, WA 98052-8300, USA

MODEL : HWB-Q94/HWB-Q93

FCC ID : C3K00002101

IC : 3048A-00002101

EUT Description : Radio Module

Test Standard(s) : FCC 47 CFR Part 15 Subpart E:2025
ISED RSS-248 Issue 2:2022
ISED RSS-GEN Issue 5 +A1+A2:2021

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Prepared by:
UL LLC
12 Laboratory Dr.
Research Triangle Park, NC 27709 U.S.A.
TEL: (919) 549-1400



REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2025-04-14	Initial Issue	B. Kiewra
V2	2025-04-15	Added model HWB-Q93 to cover page, section 1, and section 6.1 Revised note 1 in section 2 to include information re: power tuning. Revised max EIRP in section 6.3	B. Kiewra

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Microsoft Corporation
1 Microsoft Way
Redmond, WA 98052-8300, USA

EUT DESCRIPTION Radio Module

MODEL: HWB-Q94/HWB-Q93

SERIAL NUMBER: 075AO4, 1083O4

SAMPLE RECEIPT DATE: 2024-06-20 to 2024-12-17

DATE TESTED: 2024-12-13 to 2025-02-11

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
47 CFR Part 15 Subpart E	Refer to section 2
ISED RSS-248 Issue 2	Refer to section 2
ISED RSS-GEN Issue 5+A1+A2	Refer to section 2

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.

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.

Approved & Released
For UL LLC By:

Prepared By:



Michael Antola
Staff Engineer
Consumer, Medical and IT Segment
UL LLC



Brian Kiewra
Project Engineer
Consumer, Medical and IT Segment
UL LLC

2. TEST RESULT SUMMARY

FCC Clause	ISED Clause	Requirement	Result	Comment
See Comment		Duty Cycle	Not Performed	See Note 1
See Comment	RSS-248 4.4	99% BW	Not Performed	See Note 1
§15.407 (a) (10)	NA	26dB BW		
§15.407 (a) (7)	RSS-248 4.5.5	Output Power e.i.r.p.	Compliant	Client device operating under the control of SP AP
§15.407 (a) (8)	RSS-248 4.5.3	Output Power e.i.r.p.	Compliant	Indoor Client.
§15.407 (a) (7)	RSS-248 4.5.5	Power Spectral Density	See Comment	Client device operating under the control of SP AP See Note 1
§15.407 (a) (8)	RSS-248 4.5.3	Power Spectral Density	See Comment	Indoor Client. See Note 1
§15.407 (b) (5)	RSS-248 4.6.2 (a)	Emissions outside 5.925-7.125 GHz band	See Comment	See Note 1
§15.407 (b) (6)	RSS-248 4.6.2 (b)	Emissions within 5.925-7.125 GHz Band (Emissions Mask)	See Comment	See Note 1
§15.407 (d) (6)	RSS-248 4.7	Contention-based protocol	Not Tested	See Separate Report
§15.205, §15.209	RSS-GEN 8.9, 8.10	Radiated Spurious Emissions	See comment	See Note 1
§15.207	RSS-Gen 8.8	AC Mains Conducted Emissions	Not Applicable	None

NOTE 1: This test report covers a Class 2 Permissive Change to a radio module that has implemented the addition of a Coex Filter. For this report, only spot-checks to the PSD, Radiated Spurious Emissions, Bandedge, and full power remeasurements were performed. These spot checks were found to be compliant. Some modes required additional power tuning to be performed. All conducted (duty cycle, bandwidth and conducted spurious) and radiated emissions data were not required for retest. Full test results can be found in R15374786-E4

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with;

- FCC 47 CFR Part 2
- FCC 47 CFR Part 15
- FCC KDB 662911 D01 v02r01
- FCC KDB 789033 D02 v02r01
- ANSI C63.10-2020
- RSS-GEN Issue 5 + A1/2
- RSS-248 Issue 2
- FCC KDB 987594 D01 v03r03
- FCC KDB 987594 D02 v03

4. FACILITIES AND ACCREDITATION

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

	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		27265	

5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U _{Lab}
Radio Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	1.22%
RF output power, conducted	1.3 dB (PK) 0.45 dB (AV)
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	1.94 dB
All emissions, radiated	6.01 dB
Mains Conducted Emissions (0.150-30MHz) - LISN	3.40 dB
Temperature	0.57°C
Humidity	3.39%
DC Supply voltages	1.70%

Uncertainty figures are valid to a confidence level of 95%.

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB + 10.1 dB + 0 dB = 46.6 dBuV

OUTPUT POWER (EIRP)

Conducted Power + Ant Gain = EIRP:

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a Radio Module with BT, BLE, 2.4GHz WLAN, 5GHz WLAN, and 6GHz WLAN. This report covers spot check testing on the 6GHz WLAN radio. The full test suite is detailed in section 6.6.

The module has two versions, with minor differences in the digital circuitry to interface with either x86 (HWB-Q94) or ARM (HWB-Q93) processors. Microsoft have verified that the differences between the HWB-Q93 and HWB-Q94 have no impact on the rf performance reported in the original filing and in this permissive change filing. Testing in this report was performed on the HWB-Q94 version.

6.2. EUT DEVICE CLASS

EUT is of the following device class:

	U-NII Bands of Operation			
	5	6	7	8
Dual Client (6CD) LPI	☒	☒	☒	☒
Dual Client (6CD) SP	☒	☒	☒	☐

Note: SP for UNII6 is for ISSED only.

6.3. MAXIMUM E.I.R.P

The transmitter has a maximum e.i.r.p. output power as follows:

U-NII 5 (5.925-6.425 GHz) BAND

Frequency Range (MHz)	Mode	EIRP (dBm)	EIRP (mW)
SP			
5955-6415	802.11a	25.77	377.57
	802.11be EHT20 OFDMA, 26T	17.47	55.85
	802.11be EHT20 OFDMA, 52T	20.29	106.91
	802.11be EHT20 OFDMA, 52T+26T	20.62	115.35
	802.11be EHT20 OFDMA, 106T	23.36	216.77
	802.11be EHT20 OFDMA, 106T+26T	23.65	231.74
	802.11be EHT20 OFDMA, 242T	25.73	374.11
5965-6405	802.11be EHT40 OFDMA, 484T	29.30	851.14
5985-6385	802.11be EHT80 OFDMA, 484T+242T (C)	29.16	824.14
	802.11be EHT80 OFDMA, 484T+242T (NC)	29.14	820.35
	802.11be EHT80 OFDMA, 242T+484T (NC)	29.09	810.96
	802.11be EHT80 OFDMA, 996T	28.99	792.50
6025-6345	802.11be EHT160 OFDMA, 996T+484T (C)	27.74	594.29
	802.11be EHT160 OFDMA, 996T+484T (NC)	27.85	609.54
	802.11be EHT160 OFDMA, 484T+996T (NC)	27.77	598.41
	802.11be EHT160 OFDMA, 996T+484T+242T (C)	27.22	527.23
	802.11be EHT160 OFDMA, 996T+484T+242T (NC)	27.20	524.81
	802.11be EHT160 OFDMA, 996T+242T+484T (NC)	27.17	521.19
	802.11be EHT160 OFDMA, 996T+242T+484T (NC2)	27.11	514.04
	802.11be EHT160 OFDMA, 242T+484T+996T(NC)	27.10	512.86
	802.11be EHT160 OFDMA, 484T+242T+996T(NC)	27.14	517.61
	802.11be EHT160 OFDMA, 484T+242T+996T(NC2)	27.09	511.68
	802.11be EHT160 OFDMA, 2x996T	28.83	763.84
6105-6265	802.11be EHT320 OFDMA, 2x996T+484T (C)	26.18	414.95
	802.11be EHT320 OFDMA, 2x996T+484T (NC)	26.28	424.62
	802.11be EHT320 OFDMA, 484T+2x996T (NC)	26.26	422.67
	802.11be EHT320 OFDMA, 996T+484T+996T (NC)	26.20	416.87
	802.11be EHT320 OFDMA, 996T+484T+996T (NC2)	26.18	414.95
	802.11be EHT320 OFDMA, 3x996T(C)	26.09	406.44
	802.11be EHT320 OFDMA, 3x996T(NC)	25.94	392.64
	802.11be EHT320 OFDMA, 3x996T(NC2)	26.02	399.94
	802.11be EHT320 OFDMA, 3x996T+484T(C)	26.27	423.64
	802.11be EHT320 OFDMA, 3x996T+484T(NC)	26.53	449.78
	802.11be EHT320 OFDMA, 484T+3x996T(NC)	26.21	417.83
	802.11be EHT320 OFDMA, 996T+484T+2x996T (NC)	26.19	415.91
	802.11be EHT320 OFDMA, 996T+484T+2x996T (NC2)	26.18	414.95
	802.11be EHT320 OFDMA, 2x996T+484T+996T (NC)	26.04	401.79
	802.11be EHT320 OFDMA, 2x996T+484T+996T (NC2)	26.30	426.58
	802.11be EHT320 OFDMA, 4x996T	29.08	809.10

Frequency Range (MHz)	Mode	EIRP (dBm)	EIRP (mW)
LPI			
5955-6415	802.11a	7.65	5.82
	802.11be EHT20 OFDMA, 26T	-1.08	0.78
	802.11be EHT20 OFDMA, 52T	1.89	1.55
	802.11be EHT20 OFDMA, 52T+26T	1.66	1.47
	802.11be EHT20 OFDMA, 106T	4.32	2.70
	802.11be EHT20 OFDMA, 106T+26T	4.27	2.67
	802.11be EHT20 OFDMA, 242T	8.02	6.34
5965-6405	802.11be EHT40 OFDMA, 484T	11.54	14.26
5985-6385	802.11be EHT80 OFDMA, 484T+242T (C)	11.77	15.03
	802.11be EHT80 OFDMA, 484T+242T (NC)	11.27	13.40
	802.11be EHT80 OFDMA, 242T+484T (NC)	11.66	14.66
	802.11be EHT80 OFDMA, 996T	14.51	28.25
6025-6345	802.11be EHT160 OFDMA, 996T+484T (C)	15.29	33.81
	802.11be EHT160 OFDMA, 996T+484T (NC)	15.28	33.73
	802.11be EHT160 OFDMA, 484T+996T (NC)	15.29	33.81
	802.11be EHT160 OFDMA, 996T+484T+242T (C)	15.11	32.43
	802.11be EHT160 OFDMA, 996T+484T+242T (NC)	15.07	32.14
	802.11be EHT160 OFDMA, 996T+242T+484T (NC)	15.08	32.21
	802.11be EHT160 OFDMA, 996T+242T+484T (NC2)	15.07	32.14
	802.11be EHT160 OFDMA, 242T+484T+996T(NC)	15.02	31.77
	802.11be EHT160 OFDMA, 484T+242T+996T(NC)	15.13	32.58
	802.11be EHT160 OFDMA, 484T+242T+996T(NC2)	15.09	32.28
	802.11be EHT160 OFDMA, 2x996T	17.74	59.43
6105-6265	802.11be EHT320 OFDMA, 2x996T+484T (C)	17.83	60.67
	802.11be EHT320 OFDMA, 2x996T+484T (NC)	17.85	60.95
	802.11be EHT320 OFDMA, 484T+2x996T (NC)	17.83	60.67
	802.11be EHT320 OFDMA, 996T+484T+996T (NC)	17.83	60.67
	802.11be EHT320 OFDMA, 996T+484T+996T (NC2)	17.83	60.67
	802.11be EHT320 OFDMA, 3x996T(C)	17.65	58.21
	802.11be EHT320 OFDMA, 3x996T(NC)	17.61	57.68
	802.11be EHT320 OFDMA, 3x996T(NC2)	17.60	57.54
	802.11be EHT320 OFDMA, 3x996T+484T(C)	17.75	59.57
	802.11be EHT320 OFDMA, 3x996T+484T(NC)	17.74	59.43
	802.11be EHT320 OFDMA, 484T+3x996T(NC)	17.73	59.29
	802.11be EHT320 OFDMA, 996T+484T+2x996T (NC)	17.74	59.43
	802.11be EHT320 OFDMA, 996T+484T+2x996T (NC2)	17.74	59.43
	802.11be EHT320 OFDMA, 2x996T+484T+996T (NC)	17.78	59.98
	802.11be EHT320 OFDMA, 2x996T+484T+996T (NC2)	17.75	59.57
	802.11be EHT320 OFDMA, 4x996T	21.05	127.35

U-NII-6 (6.425-6.525 GHz) BAND

Frequency Range (MHz)	Mode	EIRP (dBm)	EIRP (mW)
LPI			
6435-6515	802.11a	7.15	5.19
	802.11be EHT20 OFDMA, 26T	-0.15	0.97
	802.11be EHT20 OFDMA, 52T	2.39	1.73
	802.11be EHT20 OFDMA, 52T+26T	2.17	1.65
	802.11be EHT20 OFDMA, 106T	4.30	2.69
	802.11be EHT20 OFDMA, 106T+26T	4.34	2.72
	802.11be EHT20 OFDMA, 242T	6.84	4.83
6445-6485	802.11be EHT40 OFDMA, 484T	10.75	11.89
6465-6545	802.11be EHT80 OFDMA, 484T+242T (C) Low	10.75	11.89
	802.11be EHT80 OFDMA, 484T+242T (C) High	10.70	11.75
	802.11be EHT80 OFDMA, 242T+484T (NC)	10.75	11.89
	802.11be EHT80 OFDMA, 484T+242T (NC)	11.06	12.76
	802.11be EHT80 OFDMA, 996T	13.70	23.44
6505	802.11be EHT160 OFDMA, 996T+484T (C) Low	14.02	25.23
	802.11be EHT160 OFDMA, 996T+484T (C) High	14.06	25.47
	802.11be EHT160 OFDMA, 996T+484T (NC)	13.81	24.04
	802.11be EHT160 OFDMA, 484T+996T (NC)	13.80	23.99
	802.11be EHT160 OFDMA, 996T+484T+242T (C) Punctured 0x80	13.60	22.91
	802.11be EHT160 OFDMA, 996T+484T+242T (C) Punctured 0x01	13.46	22.18
	802.11be EHT160 OFDMA, 996T+484T+242T (NC)	13.55	22.65
	802.11be EHT160 OFDMA, 996T+242T+484T (NC)	13.35	21.63
	802.11be EHT160 OFDMA, 996T+242T+484T (NC2)	13.59	22.86
	802.11be EHT160 OFDMA, 242T+484T+996T(NC)	13.63	23.07
	802.11be EHT160 OFDMA, 484T+242T+996T(NC)	13.46	22.18
	802.11be EHT160 OFDMA, 484T+242T+996T(NC2)	13.35	21.63
	802.11be EHT160 OFDMA, 2x996T	17.28	53.46
6425-6585	802.11be EHT320 OFDMA, 2x996T+484T (C) MRU6	18.49	70.63
	802.11be EHT320 OFDMA, 2x996T+484T (C) MRU1	18.39	69.02
	802.11be EHT320 OFDMA, 2x996T+484T (C) MRU7	18.06	63.97
	802.11be EHT320 OFDMA, 2x996T+484T (C) MRU12	18.23	66.53
	802.11be EHT320 OFDMA, 2x996T+484T (NC) MRU5	18.39	69.02
	802.11be EHT320 OFDMA, 2x996T+484T (NC) MRU11	18.18	65.77
	802.11be EHT320 OFDMA, 484T+2x996T (NC)	18.35	68.39
	802.11be EHT320 OFDMA, 484T+2x996T (NC2)	17.38	54.70
	802.11be EHT320 OFDMA, 996T+484T+996T (NC) Low	18.32	67.92
	802.11be EHT320 OFDMA, 996T+484T+996T (NC) High	18.10	64.57
	802.11be EHT320 OFDMA, 996T+484T+996T (NC2) Low	18.41	69.34
	802.11be EHT320 OFDMA, 996T+484T+996T (NC2) High	18.16	65.46
	802.11be EHT320 OFDMA, 3x996T(C) Low	18.19	65.92
	802.11be EHT320 OFDMA, 3x996T(C) High	17.97	62.66
	802.11be EHT320 OFDMA, 3x996T(NC)	17.97	62.66
	802.11be EHT320 OFDMA, 3x996T(NC2)	18.07	64.12
	802.11be EHT320 OFDMA, 3x996T+484T(C) Low	18.20	66.07
	802.11be EHT320 OFDMA, 3x996T+484T(C) High	18.16	65.46
	802.11be EHT320 OFDMA, 3x996T+484T(NC)	18.24	66.68
	802.11be EHT320 OFDMA, 484T+3x996T(NC)	18.13	65.01
	802.11be EHT320 OFDMA, 996T+484T+2x996T (NC)	18.12	64.86
	802.11be EHT320 OFDMA, 996T+484T+2x996T (NC2)	18.16	65.46
	802.11be EHT320 OFDMA, 2x996T+484T+996T (NC)	18.16	65.46
	802.11be EHT320 OFDMA, 2x996T+484T+996T (NC2)	18.16	65.46
	802.11be EHT320 OFDMA, 4x996T	19.77	94.84

U-NII-7 (6.525-6.875 GHz) BAND

Frequency Range (MHz)	Mode	ERP (dBm)	ERP (mW)
SP			
6535-6855	802.11a	25.60	363.08
	802.11be EHT20 OFDMA, 26T	17.28	53.46
	802.11be EHT20 OFDMA, 52T	19.95	98.86
	802.11be EHT20 OFDMA, 52T+26T	21.44	139.32
	802.11be EHT20 OFDMA, 106T	22.33	171.00
	802.11be EHT20 OFDMA, 106T+26T	22.34	171.40
	802.11be EHT20 OFDMA, 242T	25.59	362.24
6565-6845	802.11be EHT40 OFDMA, 484T	29.15	822.24
6625-6785	802.11be EHT80 OFDMA, 484T+242T (C) Low	28.85	767.36
	802.11be EHT80 OFDMA, 484T+242T (C) High	29.03	799.83
	802.11be EHT80 OFDMA, 484T+242T (NC)	28.86	769.13
	802.11be EHT80 OFDMA, 242T+484T (NC)	28.76	751.62
	802.11be EHT80 OFDMA, 996T	28.63	729.46
6665	802.11be EHT160 OFDMA, 996T+484T (C) Low	26.69	466.66
	802.11be EHT160 OFDMA, 996T+484T (C) High	26.72	469.89
	802.11be EHT160 OFDMA, 996T+484T (NC)	26.82	480.84
	802.11be EHT160 OFDMA, 484T+996T (NC)	26.76	474.24
	802.11be EHT160 OFDMA, 242T+484T+996T(NC)	26.15	412.10
	802.11be EHT160 OFDMA, 484T+242T+996T(NC)	26.26	422.67
	802.11be EHT160 OFDMA, 484T+242T+996T(NC2)	26.21	417.83
	802.11be EHT160 OFDMA, 996T+484T+242T (C) Low	26.11	408.32
	802.11be EHT160 OFDMA, 996T+484T+242T (C) High	26.18	414.95
	802.11be EHT160 OFDMA, 996T+484T+242T (NC)	26.22	418.79
	802.11be EHT160 OFDMA, 996T+242T+484T (NC)	26.22	418.79
	802.11be EHT160 OFDMA, 996T+242T+484T (NC2)	26.26	422.67
	802.11be EHT160 OFDMA, 2x996T	27.65	582.10

Frequency Range (MHz)	Mode	ERP (dBm)	ERP (mW)
LPI			
6535-6855	802.11a	8.95	7.85
	802.11be EHT20 OFDMA, 26T	-0.87	0.82
	802.11be EHT20 OFDMA, 52T	1.90	1.55
	802.11be EHT20 OFDMA, 52T+26T	1.86	1.53
	802.11be EHT20 OFDMA, 106T	4.47	2.80
	802.11be EHT20 OFDMA, 106T+26T	4.47	2.80
	802.11be EHT20 OFDMA, 242T	6.87	4.86
6565-6845	802.11be EHT40 OFDMA, 484T	11.26	13.37
6625-6785	802.11be EHT80 OFDMA, 484T+242T (C) Low	11.16	13.06
	802.11be EHT80 OFDMA, 484T+242T (C) High	11.18	13.12
	802.11be EHT80 OFDMA, 484T+242T (NC)	10.67	11.67
	802.11be EHT80 OFDMA, 242T+484T (NC)	11.12	12.94
	802.11be EHT80 OFDMA, 996T	14.89	30.83
6665	802.11be EHT160 OFDMA, 996T+484T (C) Low	14.87	30.69
	802.11be EHT160 OFDMA, 996T+484T (C) High	14.91	30.97
	802.11be EHT160 OFDMA, 996T+484T (NC)	14.94	31.19
	802.11be EHT160 OFDMA, 484T+996T (NC)	14.96	31.33
	802.11be EHT160 OFDMA, 242T+484T+996T(NC)	14.37	27.35
	802.11be EHT160 OFDMA, 484T+242T+996T(NC)	14.23	26.49
	802.11be EHT160 OFDMA, 484T+242T+996T(NC2)	14.29	26.85
	802.11be EHT160 OFDMA, 996T+484T+242T (C) Low	14.48	28.05
	802.11be EHT160 OFDMA, 996T+484T+242T (C) High	14.30	26.92
	802.11be EHT160 OFDMA, 996T+484T+242T (NC)	14.29	26.85
	802.11be EHT160 OFDMA, 996T+242T+484T (NC)	14.39	27.48
	802.11be EHT160 OFDMA, 996T+242T+484T (NC2)	14.35	27.23
	802.11be EHT160 OFDMA, 2x996T	17.78	59.98

U-NII 8 (6.875-7.125 GHz) BAND

Frequency Range (MHz)	Mode	EIRP (dBm)	EIRP (mW)
LPI			
6875-7115	802.11a	6.93	4.93
	802.11be EHT20 OFDMA, 26T	-0.85	0.82
	802.11be EHT20 OFDMA, 52T	2.10	1.62
	802.11be EHT20 OFDMA, 52T+26T	2.02	1.59
	802.11be EHT20 OFDMA, 106T	4.62	2.90
	802.11be EHT20 OFDMA, 106T+26T	4.61	2.89
	802.11be EHT20 OFDMA, 242T	6.69	4.67
6885-7085	802.11be EHT40 OFDMA, 484T	11.25	13.34
6865-7025	802.11be EHT80 OFDMA, 484T+242T (C)	11.56	14.32
	802.11be EHT80 OFDMA, 484T+242T (NC)	11.55	14.29
	802.11be EHT80 OFDMA, 242T+484T (NC)	11.51	14.16
	802.11be EHT80 OFDMA, 996T	15.15	32.73
6825-6985	802.11be EHT160 OFDMA, 996T+484T (C)	15.01	31.70
	802.11be EHT160 OFDMA, 996T+484T (NC)	15.12	32.51
	802.11be EHT160 OFDMA, 484T+996T (NC)	15.01	31.70
	802.11be EHT160 OFDMA, 242T+484T+996T(NC)	14.80	30.20
	802.11be EHT160 OFDMA, 484T+242T+996T(NC)	14.43	27.73
	802.11be EHT160 OFDMA, 484T+242T+996T(NC2)	14.85	30.55
	802.11be EHT160 OFDMA, 996T+484T+242T (C)	14.60	28.84
	802.11be EHT160 OFDMA, 996T+484T+242T (NC)	14.71	29.58
	802.11be EHT160 OFDMA, 996T+242T+484T (NC)	14.66	29.24
	802.11be EHT160 OFDMA, 996T+242T+484T (NC2)	14.81	30.27
	802.11be EHT160 OFDMA, 2x996T	16.66	46.34
6745-6905	802.11be EHT320 OFDMA, 2x996T+484T (C)	17.74	59.43
	802.11be EHT320 OFDMA, 2x996T+484T (NC)	16.95	49.55
	802.11be EHT320 OFDMA, 484T+2x996T (NC)	17.35	54.33
	802.11be EHT320 OFDMA, 996T+484T+996T (NC)	16.75	47.32
	802.11be EHT320 OFDMA, 996T+484T+996T (NC2)	16.73	47.10
	802.11be EHT320 OFDMA, 3x996T(C)	17.37	54.58
	802.11be EHT320 OFDMA, 3x996T(NC)	17.41	55.08
	802.11be EHT320 OFDMA, 3x996T(NC2)	17.38	54.70
	802.11be EHT320 OFDMA, 3x996T+484T(C)	17.47	55.85
	802.11be EHT320 OFDMA, 3x996T+484T(NC)	17.68	58.61
	802.11be EHT320 OFDMA, 484T+3x996T(NC)	17.49	56.10
	802.11be EHT320 OFDMA, 996T+484T+2x996T (NC)	17.68	58.61
	802.11be EHT320 OFDMA, 996T+484T+2x996T (NC2)	17.43	55.34
	802.11be EHT320 OFDMA, 2x996T+484T+996T (NC)	17.63	57.94
	802.11be EHT320 OFDMA, 2x996T+484T+996T (NC2)	17.10	51.29
	802.11be EHT320 OFDMA, 4x996T	20.29	106.91

6.4. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna(s) gain and type, as provided by the manufacturer' are as follows:

Frequency Range (MHz)	Maximum Gain Chain 0 (dBi)	Maximum Gain Chain 1 (dBi)	MIMO Uncorrelated Gain (dBi)	MIMO Correlated Gain (dBi)	Type
5925-7125 (low gain)	5.2	5.2	5.2	8.21	PIFA
5925-7125 (mid gain)	7.3	7.3	7.3	10.31	PIFA
5925-6525 UNII 5/6 (high gain)	8.6	8.6	8.6	11.61	PIFA
6525-7125 UNII 7/8 (high gain)	8.2	8.2	8.2	11.21	PIFA

Antenna gains for MIMO operations are calculated using the formulae from KDB 662911 D01 Multiple Transmitter Output v02r01 section F. As the two antennas have the same gain equations 2)a)(i) and 2)a)(ii) for correlated and uncorrelated transmissions respectively are used.

Correlated directional gain = $G_{ANT} + 10 \log(N_{ANT})$ dBi, where $N_{ANT} = 2$ for a 2x2 MIMO device

Uncorrelated directional gain = G_{ANT}

6.5. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was 10.0.22621.1.

The test utility software used during testing was Qualcomm Radio Control Toolkit Version 4.0.118.1.

6.6. WORST-CASE CONFIGURATION AND MODE

The EUT was investigated in three orientations, the X-axis, the Y-axis and the Z-axis. The Y-axis was found to be worst-case orientation. Therefore, all final radiated testing was performed with the EUT in the Y-axis orientation.

Radiated testing run using low gain power settings with high gain antenna in order to yield worst case over the air results. Therefore, the radiated spurious emissions testing remains representative of the low and mid gain antennas as the chosen configuration represents worst case data.

Only the worst-case radiated spurious emissions mode was tested. This was found to be EHT320 4x996T at 6105MHz, EHT320 4x996T at 6585MHz, EHT20 52T at 6535MHz, and EHT320 4x996T at 6745MHz.

All testing performed in 2Tx mode (NSS=1), where power per chain is equivalent to the 1Tx power on each chain. Based on preliminary testing, this allows 2Tx testing to cover all 1Tx testing.

Worst-case data rates as provided by the client were:

802.11a mode: 6 Mbps

802.11be EHT20mode: MCS0 (Nss = 1)

802.11be EHT40mode: MCS0 (Nss = 1)

802.11be EHT80mode: MCS0 (Nss = 1)

802.11be EHT160mode: MCS0 (Nss = 1)

802.11be EHT320mode: MCS0 (Nss = 1)

Power spectral density, emissions mask, and conducted bandedge was spot-checked on the worst-case modes dictated by the original module report. The rest of conducted testing was not performed as this test report covers a Class 2 Permissive Change.

All output power was taken to verify that power on this module revision was consistent with the originally certified module.

UNII 6 SP will be covered by UNII 5/7. Treating UNII 5/6/7 as one band. Low/high UNII5 and High UNII7 as low/mid/high for band in SP mode.

6.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
NUC	Intel	NUC13ANH	BTAN322009FE	N/A
NUC	Intel	NUC13ANH	BTAN325006VF	N/A
NUC	Intel	NUC13ANH	BTAN331003QS	N/A
NUC	Intel	NUC13ANH	BTAN331002VK	N/A
Intel NUC Charger	Chicony Power Technology	A17-120P2A	0432-05LT1002320000248	N/A

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	PCI-E	1	PCI-E	Unshielded	<3	Connects EUT to NUC
2	DC Mains	1	Barrel	Unshielded	<3	Connects NUC to DC Adaptor

SETUP DIAGRAM

Please refer to R15374786-EP1 for setup diagrams

7. MEASUREMENT METHOD

On Time and Duty Cycle: KDB 789033 D02 v02r01, Section B.

26 dB Emission BW: KDB 789033 D02 v02r01, Section C.1

99% BW: KDB 789033 D02 v02r01, Section D

Conducted Output Power: KDB 789033 D02 v02r01, Section II E.3.b (Method PM-G).

Power Spectral Density (PSD): KDB 789033 D02 v02r01, Section F

Spurious emissions within 5.925-7.125 GHz Band (Emissions Mask): KDB 987594 D02 EMC Measurement Section II-J

Unwanted emissions in restricted bands: KDB 789033 D02 v02r01, Sections G.3, G.4, G.5, and G.6.

Unwanted emissions in non-restricted bands: KDB 789033 D02 v02r01, Sections G.3, G.4, and G.5.

AC Power Line Conducted Emissions: ANSI C63.10-2020, Section 6.2.

Radiated Spurious Emissions Below 30MHz: ANSI C63.10-2020 Section 6.4

8. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 1)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
1-18 GHz					
135143	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2024-02-07	2026-02-07
Gain-Loss Chains					
91979	Gain-loss string: 1-18GHz	Various	Various	2024-05-08	2025-05-08
Receiver & Software					
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-03-05	2025-03-05
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
241205	Environmental Meter	Fisher Scientific	15-077-963	2023-09-05	2025-09-05
216159 (HPF019)	7GHz high-pass filter, 2W. Fhigh =18GHz	Micro-Tronics	HPM50107	2024-03-01	2025-03-01

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 2)

Equipment ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
1-18 GHz					
86408	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2023-06-19	2025-06-19
Gain-Loss Chains					
91977	Gain-loss string: 1-18GHz	Various	Various	2024-07-17	2025-07-17
Receiver & Software					
206496	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-08-29	2025-08-29
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
200540	Environmental Meter	Fisher Scientific	15-077-963	2023-07-19	2025-07-19
216159 (HPF019)	7GHz high-pass filter, 2W, Fhigh =18GHz	Micro-Tronics	HPM50107	2024-03-01	2025-03-01

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
90416	Spectrum Analyzer	Keysight Technologies	N9030A	2024-09-23	2025-09-23
90410	Spectrum Analyzer	Keysight Technologies	N9030A	2024-06-14	2025-06-14
248881	Environmental Meter	Control Company	06-662-4	2024-04-10	2026-04-10
SOFTEMI	Antenna Port Software	UL	Version 2024.2.23	NA	NA
Power Software	Boonton Power Analyzer	Boonton	Version 3.0.13.0	NA	NA
245262	Conducted Switch Box	UL	CSB	2024-02-20	2025-02-20
211056	Real-Time Peak Power Sensor 50MHz to 8GHz	Boonton	RTP5000	2024-08-01	2025-08-01
211058	Real-Time Peak Power Sensor 50MHz to 8GHz	Boonton	RTP5000	2024-08-01	2025-08-01
250458	Average Power Sensor, 10MHz to 18GHz	Boonton	RTP4018-S/1	2024-06-27	2025-06-27
250459	Average Power Sensor, 10MHz to 18GHz	Boonton	RTP4018-S/1	2024-06-27	2025-06-27
226562	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CentricRF	C18S2-10	2024-04-11	2025-04-11
226563	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CentricRF	C18S2-10	2024-02-29	2025-02-28
226564	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CentricRF	C18S2-10	2024-04-04	2025-04-04
CBL092	Micro-Coax UTiFLEX Cable Assembly, Low Loss,40Ghz	Carlisle Interconnect Technologies	UFA147A-2-0360-200200	2024-03-01	2025-03-01
CBL028	SMA Cable	Sucoflex	104PEA	2024-02-16	2025-02-16