UN6GHZ PRE-APPROVAL GUIDANCE CHECKLIST

1. Antennas

1.1 Information for all the antennas, i.e., type, gain and relative positions within host, must be included in the filing.

Please refer to page 23 of "4790809762-1-RF-5-WiFi 6E Report_ R3 Part1" for antenna specification. Please refer to document "Internal Photos" for the antenna positions.

1.2 Show how the (aggregate, if applicable) antenna gain was computed/measured (as in TCB Workshop Presentation Aggregate Antenna Gain Review, April 2021). Provide equation(s) used to calculate Directional Gain and provide example calculation showing how the DG was calculated with the antenna gain of individual antennas. Provide details (references or attached documents) on how the individual antenna gains were derived, i.e., declared by the host manufacturer, based on data sheet, or measured. Since the CBP needs to detect a small signal, the worst case scenario to consider is when the receiver has the lowest antenna gain.

The device has the same maximum antenna gain for each antenna.

According to FCC KDB 662911 D01v02r01:

CDD Directional Gain = Antenna Gain + Array Gain, Array Gain = 0 dB for NANT ≤ 4;

please refer to page 23 of "4790809762-1-RF-5-WiFi 6E Report_ R3 Part1"

For output power measurements:
Directional gain= G_{ANT} + Array Gain = 2 dBi
G_{ANT} : equal to the gain of the antenna having the highest gain
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$

For power spectral density (PSD) measurements:

Directional gain= G_{ANT} + Array Gain = 8.02 dBi
Array Gain = 10 log(N_{ANT}/N_{SS}) dB.
N_{ANT} : number of transmit antennas
N_{SS} : number of spatial streams, when the Nss=1

Directional gain= G_{ANT} + Array Gain = 2 dBi
Array Gain = 10 log(N_{ANT}/N_{SS}) dB.
N_{ANT} : number of transmit antennas
N_{SS} : number of spatial streams, when the Nss=4

1.3 For conducted test in MIMO cases, show that the testing was done for that path that has the lowest antenna gain.

The EUT has 5 separate antennas which correspond to 5 separate antenna ports (for 6G). Core 1, Core 2, Core 3, Core 4 and Core 5 correspond to antenna 1, antenna 2, antenna 3, antenna 4 and antenna 5 respectively. Antenna 5 support RX only.testing was done for that path that has the lowest antenna gain.

2. Contention Based Protocol (CBP)

2.1 CBP testing shall be performed on one channel in each sub-band of operation for both narrowest and widest bandwidths.

Please refer to page 691-692 of "4790809762-1-RF-5-WiFi 6E Report_R3 Part11" for the test channel and bandwidth information as follows. The narrowest and widest bandwidths were test for each UNII band.

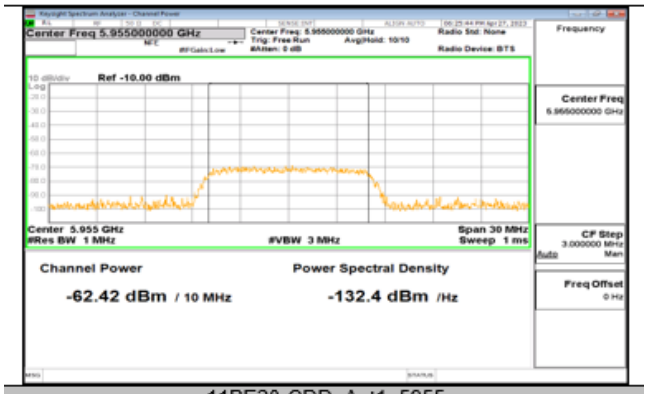
Test Mode	Antenna	EUT Frequency	AWGN Frequency	Injected AWGN Power	Minimum Antenna Gain	Path Loss	Adjusted Power Result	Limit	UT Tx Status
		[MHz]	[MHz]	[dBm]	[dBi]	[dB]	[dBm]	[dBm]	(Note1)
11BE20-CDD	Ant1	5955	5955	-69.55	2	2	-70.0	-62	ON
				-65.12	2	2	-65.31	-62	Minimal
				-62.33	2	2	-62.4184	-62	OFF
		6435	6435	-69.17	2	2	-70.0	-62	ON
				-63.67	2	2	-65.5	-62	Minimal
				-62.33	2	2	-62.2223	-62	OFF
		6535	6535	-69.21	2	2	-70.0	-62	ON
				-64.66	2	2	-65.48	-62	Minimal
				-62.33	2	2	-62.402	-62	OFF
		6895	6895	-69.33	2	2	-70.0	-62	ON
				-64.78	2	2	-65.21	-62	Minimal
				-62.25	2	2	-62.4098	-62	OFF
11BE320-CDD	Ant1	6105	5950	-69.55	2	2	-70.0	-62	ON
				-64.55	2	2	-64.53	-62	Minimal
				-62.33	2	2	-62.2841	-62	OFF
			6105	-69.51	2	2	-70.0	-62	ON
				-65.44	2	2	-65.26	-62	Minimal
				-62.29	2	2	-62.2334	-62	OFF
			6260	-69.33	2	2	-70.0	-62	ON
				-64.43	2	2	-65.87	-62	Minimal
				-62.41	2	2	-62.2702	-62	OFF
		6425	6270	-69.44	2	2	-70.0	-62	ON
				-63.56	2	2	-64.77	-62	Minimal
				-62.44	2	2	-62.344	-62	OFF
			6425	-69.21	2	2	-70.0	-62	ON
				-64.44	2	2	-65.12	-62	Minimal
				-62.57	2	2	-62.4218	-62	OFF
			6580	-69.09	2	2	-70.0	-62	ON
				-64.67	2	2	-65.54	-62	Minimal
				-62.42	2	2	-62.2197	-62	OFF
		6745	6590	-69.34	2	2	-70.0	-62	ON
				-64.76	2	2	-65.44	-62	Minimal
				-62.45	2	2	-62.3506	-62	OFF
			6745	-69.32	2	2	-70.0	-62	ON
				-64.55	2	2	-65.21	-62	Minimal
				-62.76	2	2	-62.3036	-62	OFF
			6900	-69.55	2	2	-70.0	-62	ON
				-64.64	2	2	-65.23	-62	Minimal
				-62.32	2	2	-62.459	-62	OFF
		6905	6750	-69.37	2	2	-70.0	-62	ON
				-64.42	2	2	-65.23	-62	Minimal
				-62.27	2	2	-62.4532	-62	OFF
			6905	-69.68	2	2	-70.0	-62	ON
				-64.59	2	2	-65.44	-62	Minimal
				-62.31	2	2	-62.3781	-62	OFF
			7060	-69.76	2	2	-70.0	-62	ON
				-64.88	2	2	-65.32	-62	Minimal
				-62.67	2	2	-62.3874	-62	OFF

2.2 Use three separate 10 MHz AWGN signals when testing a 320 MHz channel. The simulated incumbent signal must be a 10 MHz wide AWGN signal

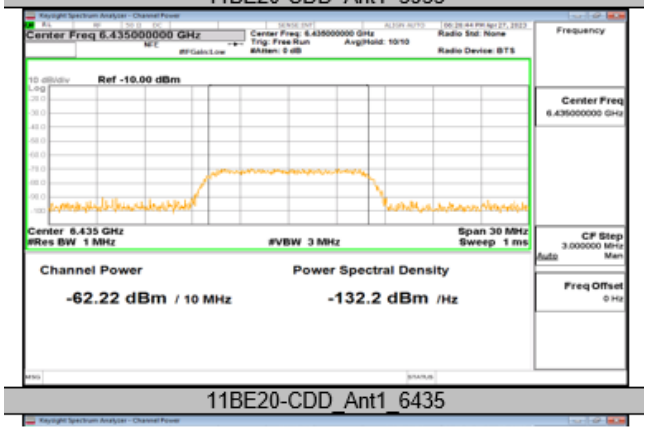
Please refer to page 692of "4790809762-1-RF-5-WiFi 6E Report_R3 Part11" for the test summary information.

Test Mode	Antenna	Frequency[MHz]	Interference Frequency [MHz]		Test Number [n]	Number Detected [n]	Result [%]	Limit [%]	Verdict
11BE20-CDD	Ant1	5955	Center	5955	10	10	100	90	PASS
		6435	Center	6435	10	10	100	90	PASS
		6535	Center	6535	10	10	100	90	PASS
		6895	Center	6895	10	10	100	90	PASS
11BE320-CDD	Ant1	6105	Low	5950	10	9	90	90	PASS
			Center	6105	10	10	100	90	PASS
			High	6260	10	10	100	90	PASS
		6425	Low	6270	10	10	100	90	PASS
			Center	6425	10	10	100	90	PASS
			High	6580	10	10	100	90	PASS
		6745	Low	6590	10	10	100	90	PASS
			Center	6745	10	10	100	90	PASS
			High	6900	10	10	100	90	PASS
		6905	Low	6750	0	10	0	90	PASS
			Center	6905	0	10	0	90	PASS
			High	7060	0	10	0	90	PASS

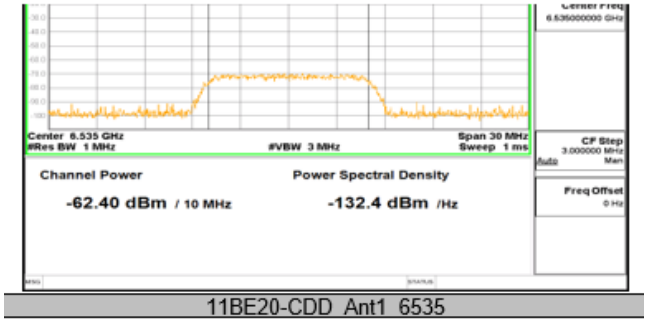
Please refer to page 696~754of "4790809762-1-RF-5-WiFi 6E Report_R3 Part11-Part 14" for the AWGN signal plots.



11BE20-CDD_Ant1_5955



11BE20-CDD_Ant1_6435



11BE20-CDD_Ant1_6535

2.3 Report lowest AWGN signal detectable by EUT

Please refer to page 691-692 of "4790809762-1-RF-5-WiFi 6E Report_R3 Part11" for lowest AWGN signal detectable by EUT.

Test Mode	Antenna	EUT Frequency	AWGN Frequency	Injected AWGN Power	Minimum Antenna Gain	Path Loss	Adjusted Power Result	Limit	UT Tx Status
		[MHz]	[MHz]	[dBm]	[dBi]	[dB]	[dBm]	[dBm]	(Note1)
11BE20-CDD	Ant1	5955	5955	-69.55	2	2	-70.0	-62	ON
				-65.12	2	2	-65.31	-62	Minimal
				-62.33	2	2	-62.4184	-62	OFF
		6435	6435	-69.17	2	2	-70.0	-62	ON
				-63.67	2	2	-65.5	-62	Minimal
				-62.33	2	2	-62.2223	-62	OFF
		6535	6535	-69.21	2	2	-70.0	-62	ON
				-64.66	2	2	-65.48	-62	Minimal
				-62.33	2	2	-62.402	-62	OFF
		6895	6895	-69.33	2	2	-70.0	-62	ON
				-64.78	2	2	-65.21	-62	Minimal
				-62.25	2	2	-62.4098	-62	OFF
11BE320-CDD	Ant1	6105	5950	-69.55	2	2	-70.0	-62	ON
				-64.55	2	2	-64.53	-62	Minimal
				-62.33	2	2	-62.2841	-62	OFF
			6105	-69.51	2	2	-70.0	-62	ON
				-65.44	2	2	-65.26	-62	Minimal
				-62.29	2	2	-62.2334	-62	OFF
			6260	-69.33	2	2	-70.0	-62	ON
				-64.43	2	2	-65.87	-62	Minimal
				-62.41	2	2	-62.2702	-62	OFF
		6425	6270	-69.44	2	2	-70.0	-62	ON
				-63.56	2	2	-64.77	-62	Minimal
				-62.44	2	2	-62.344	-62	OFF
			6425	-69.21	2	2	-70.0	-62	ON
				-64.44	2	2	-65.12	-62	Minimal
				-62.57	2	2	-62.4218	-62	OFF
			6580	-69.09	2	2	-70.0	-62	ON
				-64.67	2	2	-65.54	-62	Minimal
				-62.42	2	2	-62.2197	-62	OFF
		6745	6590	-69.34	2	2	-70.0	-62	ON
				-64.76	2	2	-65.44	-62	Minimal
				-62.45	2	2	-62.3506	-62	OFF
			6745	-69.32	2	2	-70.0	-62	ON
				-64.55	2	2	-65.21	-62	Minimal
				-62.76	2	2	-62.3036	-62	OFF
			6900	-69.55	2	2	-70.0	-62	ON
				-64.64	2	2	-65.23	-62	Minimal
				-62.32	2	2	-62.459	-62	OFF
		6905	6750	-69.37	2	2	-70.0	-62	ON
				-64.42	2	2	-65.23	-62	Minimal
				-62.27	2	2	-62.4532	-62	OFF
			6905	-69.68	2	2	-70.0	-62	ON
				-64.59	2	2	-65.44	-62	Minimal
				-62.31	2	2	-62.3781	-62	OFF
			7060	-69.76	2	2	-70.0	-62	ON
				-64.88	2	2	-65.32	-62	Minimal
				-62.67	2	2	-62.3874	-62	OFF

2.4 Verify that the testing was performed with the AWGN signal set to lowest level (for example, - 100 dBm) and increased until the EUT detects and stops transmitting.

The test was performed with a lowest AWGN signal level and increased until the EUT detects and stop transmission, and the AWGN level of AWGN signal detected (Stop but with Beacon signal) and AWGN level of the stopped transmission are recorded in the report.

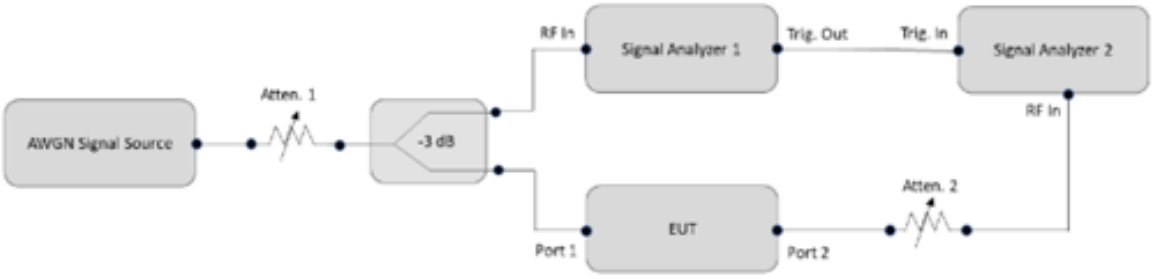
Please refer to page 691-692 of "4790809762-1-RF-5-WiFi 6E Report_R3 Part11" of RF report for the information.

Test Mode	Antenna	EUT Frequency	AWGN Frequency	Injected AWGN Power	Minimum Antenna Gain	Path Loss	Adjusted Power Result	Limit	UT Tx Status
		[MHz]	[MHz]	[dBm]	[dBi]	[dB]	[dBm]	[dBm]	(Note1)
11BE20-CDD	Ant1	5955	5955	-69.55	2	2	-70.0	-62	ON
				-65.12	2	2	-65.31	-62	Minimal
				-62.33	2	2	-62.4184	-62	OFF
		6435	6435	-69.17	2	2	-70.0	-62	ON
				-63.67	2	2	-65.5	-62	Minimal
				-62.33	2	2	-62.2223	-62	OFF
		6535	6535	-69.21	2	2	-70.0	-62	ON
				-64.66	2	2	-65.48	-62	Minimal
				-62.33	2	2	-62.402	-62	OFF
		6895	6895	-69.33	2	2	-70.0	-62	ON
				-64.78	2	2	-65.21	-62	Minimal
				-62.25	2	2	-62.4098	-62	OFF
11BE320-CDD	Ant1	6105	5950	-69.55	2	2	-70.0	-62	ON
				-64.55	2	2	-64.53	-62	Minimal
				-62.33	2	2	-62.2841	-62	OFF
			6105	-69.51	2	2	-70.0	-62	ON
				-65.44	2	2	-65.26	-62	Minimal
				-62.29	2	2	-62.2334	-62	OFF
			6260	-69.33	2	2	-70.0	-62	ON
				-64.43	2	2	-65.87	-62	Minimal
				-62.41	2	2	-62.2702	-62	OFF
		6425	6270	-69.44	2	2	-70.0	-62	ON
				-63.56	2	2	-64.77	-62	Minimal
				-62.44	2	2	-62.344	-62	OFF
			6425	-69.21	2	2	-70.0	-62	ON
				-64.44	2	2	-65.12	-62	Minimal
				-62.57	2	2	-62.4218	-62	OFF
			6580	-69.09	2	2	-70.0	-62	ON
				-64.67	2	2	-65.54	-62	Minimal
				-62.42	2	2	-62.2197	-62	OFF
		6745	6590	-69.34	2	2	-70.0	-62	ON
				-64.76	2	2	-65.44	-62	Minimal
				-62.45	2	2	-62.3506	-62	OFF
			6745	-69.32	2	2	-70.0	-62	ON
				-64.55	2	2	-65.21	-62	Minimal
				-62.76	2	2	-62.3036	-62	OFF
		6905	6900	-69.55	2	2	-70.0	-62	ON
				-64.64	2	2	-65.23	-62	Minimal
				-62.32	2	2	-62.459	-62	OFF
			6750	-69.37	2	2	-70.0	-62	ON
				-64.42	2	2	-65.23	-62	Minimal
				-62.27	2	2	-62.4532	-62	OFF
			6905	-69.68	2	2	-70.0	-62	ON
				-64.59	2	2	-65.44	-62	Minimal
				-62.31	2	2	-62.3781	-62	OFF
			7060	-69.76	2	2	-70.0	-62	ON
				-64.88	2	2	-65.32	-62	Minimal
				-62.67	2	2	-62.3874	-62	OFF

2.5 If conducted measurements are used, the detection threshold needs to be corrected to refer to a 0 dBi gain antenna and include all the applicable losses (cables, etc.). For instance, the report should show (at least): Detection Level = Injected AWGN Power (dBm) – Antenna Gain (dBi) + Path Loss (dB)

Conducted test is performed for this device.

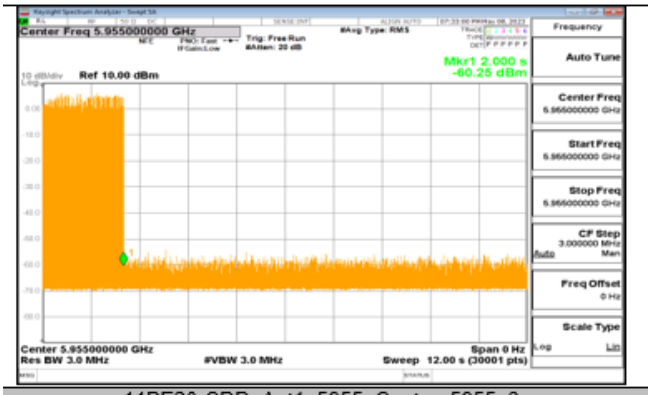
Please refer to page 43of "4790809762-1-RF-5-WiFi 6E Report_R3 Part1" for the test setup diagram as below.



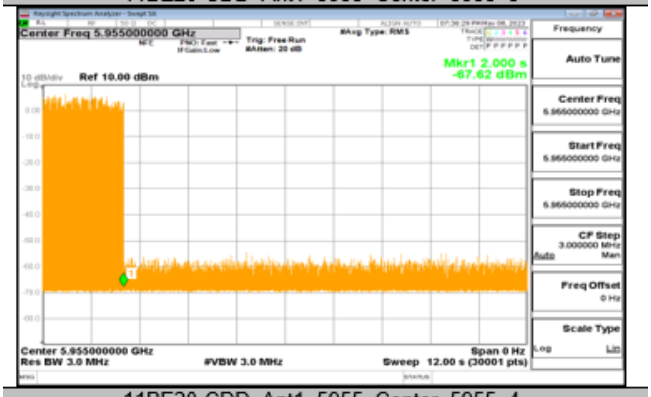
Please refer to page 42 of "4790809762-1-RF-5-WiFi 6E Report_R3 Part1" for the relevant description.

1. Configure the EUT to transmit with a constant duty cycle.
2. Set the operating parameters of the EUT including power level, operating frequency, modulation and bandwidth.
3. Set the signal analyzer center frequency to the nominal EEUT channel center frequency. The span range of the signal analyzer shall be between two times and five times the OBW of the EUT. Connect the output port of the EUT to the signal analyzer 2, as shown in Figure 2. Ensure that the attenuator 2 provides enough attenuation to not overload the signal analyzer 2 receiver.
4. Monitoring the signal analyzer 2, verify the EUT is operating and transmitting with the parameters set at step two.
5. Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use Table 1 to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
6. Set the AWGN signal power to an extremely low level (more than 20 dB below the -62 dBm threshold). Connect the AWGN signal source, via a 3-dB splitter, to the signal analyzer 1 and the EUT as shown in Figure 2.
7. Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer 1.
8. Monitor the signal analyzer 2 to verify if the AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, then incrementally increase the AWGN signal power level until the EUT stops transmitting.
9. (Including all losses in the RF paths) Determine and record the AWGN signal power level (at the EUT's antenna port) at which the EUT ceased transmission. Repeat the procedure at least 10 times to verify the EUT can detect an AWGN signal with 90% (or better) level of certainty.
10. Refer to Table 1 to determine number of times the detection threshold testing needs to be repeated. If testing is required more than once, then go back to step 5, choose a different center frequency for the AWGN signal and repeat the process.

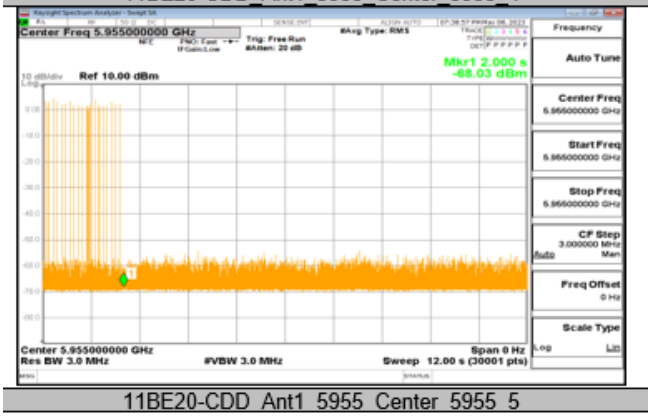
2.6 Include plots showing EUT has stopped transmitting after detection of AWGN signal. Please refer to page 701~754of "4790809762-1-RF-5-WiFi 6E Report_R3 Part11-Part 14" for the test result. Following is example.



11BE20-CDD_Ant1_5955_Center_5955_3



11BE20-CDD_Ant1_5955_Center_5955_4



11BE20-CDD_Ant1_5955_Center_5955_5

2.7 Describe whether channel puncturing and/or bandwidth reduction mechanisms supported. The report needs to include a plot as an example for at least one of the AWGN signals used.

Not Support.

2.8 If radiated testing is used, show that spot-checks were done to identify which side of the EUT has the lowest sensitivity to the incumbent signal detection, and that side was indeed chosen for the test.

Conducted test is performed for this device.

3. Client Device Limitations

This device is not a client device.

4. Emission Mask

4.1 Power spectral density suppression complies with 47 CFR § 15.407(b)(6).

Please refer to APPENDIX E of "4790809762-1-RF-5-WiFi 6E Report_R3 Part14" for the test result of power spectral density suppression.

4.2 If EUT supports OFDMA discuss testing of partial Resource Unit (RU) configurations. In any case the shape of the mask shall be based on full RU.

EUT supports one configuration only in 802.11ax/be full RU mode.

please also check page 2 on operation description.

4.3 OOBE limits only apply outside of the 5.925-7.125 GHz band. All in-band emissions need to meet the channel mask. In case a higher RBW for the in-Band Emissions Mask is used (i.e., a more conservative case) that should be noted.

Please refer to Appendix E of "4790809762-1-RF-5-WiFi 6E Report_R3 Part14" for the test result of channel mask

5. Filing

99% of the occupied bandwidth must be contained within all the U-NII sub bands authorized for that equipment class.

Please refer to Appendix A2. of "4790809762-1-RF-5-WiFi 6E Report_R3 Part14" for the test result of OBW

6. Hearing Aid Compatibility (HAC)

Not Applicable.

7. Labelling

7.1 Label showing indoor only for Subordinate and APs.

Please refer to the document “Label and Label Location”. The label showing “Indoor User only”.）

7.2 E-labelling may be acceptable if proper justification is provided

Not Applicable.

8. Modular Certifications (when applicable)

Not Applicable.

9. RF Exposure

9.1 Demonstrate applicable classification (portable/mobile/fixed) in reference to worst-case scenario use cases

The RF Exposure report is “4790787142-1-RF-3_FCC MPE Report”. Page 8 of the report states the calculated distance is 20 cm.

9.2 Address f > 6 GHz RF exposure via most recent applicable KDB or TCB Workshop procedures.

“4790787142-1-RF-3_FCC MPE Report” was used the most recent KDB to count the RF exposure.

9.3 Address all applicable simultaneous transmission conditions using the compliance condition *TER*≤1.

The RF Exposure report is “4790787142-1-RF-3_FCC MPE Report”. Page 8 of the report states that the device compliance simultaneous transmission conditions.

10. Security

Provide specific exhibit with device security description is required (complying with 47 CFR § 15.407(i))

please refer to "Software Security Requirements Cover Letter"

11. Spurious Emissions

Show that measurements are made at the prescribed antenna heights, per KDB Publication 987594 D01, including measurements along all three axes, as per ANSI C63.10.

Spurious Emissions test items refer to page 88-286of "4790809762-1-RF-5-WiFi 6E Report_R3 Part1-2".

All the test is performed according the KDB 987594 and ANSI C63.10 requirements.

For spurious emission test, every axis (X, Y, Z) was also verified. The test results shown in the report represent the worst-case emissions.