

RF EXPOSURE EVALUATION

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency(RF) Radiation as specified in §1.1307(b)

FCC ID: 2BBEG-HFX8AMC

EUT Specification

EUT	Wifi Module
Frequency band (Operating)	☒ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz ☒ WLAN: 5.745GHz ~ 5825GHz
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation)
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm ²) ☒ General Population/Uncontrolled exposure (S=1mW/cm ²)
Antenna diversity	☐ Single antenna ☒ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity
Rating	DC 3.3V
Max. output power (peak power)	5180 MHz to 5240 MHz: 12.83dBm 5260 MHz to 5320 MHz: 11.44dBm 5500 MHz to 5700 MHz: 15.91dBm 5745 MHz to 5825 MHz: 14.63dBm
Antenna gain (Max)	ANT1: 4.97dBi ANT2: 4.97dBi
Evaluation applied	☒ MPE Evaluation ☐ SAR Evaluation

Limits for Maximum Permissible Exposure(MPE)

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm ²)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300-1500	--	--	F/1500	6
1500-100000	--	--	1	30

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = Power density in mW/cm^2 , P_{out} = output power to antenna in Mw

G = gain of antenna in linear scale, $P_i = 3.1416$

R = distance between observation point and center of the radiator in $\text{cm} = 20\text{cm}$

P_d the limit of MPE, $1\text{mW}/\text{cm}^2$. If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

Measurement Result

5.8GHz WIFI:

Operation Mode	Channel Number	Channel Frequency (MHz)	Measurement Level (dBm)			Limit (dBm)	Verdict
			Ant1	Ant2	Sum		
802.11a	CH36	5180	9.5	10.44	--	22.02	PASS
	CH40	5200	9.2	9.02	--	22.02	PASS
	CH48	5240	8.33	8	--	22.02	PASS
	CH52	5260	8.71	8.21	--	22.02	PASS
	CH60	5300	7.42	8.82	--	22.11	PASS
	CH64	5320	8.65	7.91	--	22.14	PASS
	CH100	5500	12.59	12.03	--	22.02	PASS
	CH120	5600	12.56	10.82	--	22.14	PASS
	CH140	5700	12.42	10.58	--	22.13	PASS
	CH149	5745	12.4	11.11	--	28.02	PASS
	CH157	5785	12.86	11.6	--	28.02	PASS
	CH165	5825	10.27	11.97	--	28.02	PASS
802.11n (HT20)	CH36	5180	9.31	9.67	12.5	22.02	PASS
	CH40	5200	9.15	9.2	12.19	22.02	PASS
	CH48	5240	8.71	8.84	11.79	22.02	PASS
	CH52	5260	8.5	8.35	11.44	22.02	PASS
	CH60	5300	7.94	8	10.98	22.02	PASS
	CH64	5320	8.18	8.08	11.14	22.02	PASS
	CH100	5500	13.53	10.98	15.45	22.02	PASS
	CH120	5600	13.67	11.09	15.58	22.38	PASS
	CH140	5700	13.55	10.51	15.3	22.36	PASS
	CH149	5745	11.02	11.34	14.19	28.02	PASS
	CH157	5785	11.28	11.74	14.53	28.02	PASS
	CH165	5825	10.42	12.14	14.37	28.02	PASS
802.11ac (VHT20)	CH36	5180	9.47	10.15	12.83	22.02	PASS
	CH40	5200	9.29	10.07	12.71	22.02	PASS
	CH48	5240	8.91	9.91	12.45	22.02	PASS
	CH52	5260	8.24	8.34	11.3	22.02	PASS
	CH60	5300	7.96	7.98	10.98	22.02	PASS
	CH64	5320	8.2	8.03	11.13	22.02	PASS
	CH100	5500	12.77	12.3	15.55	22.02	PASS
	CH120	5600	13.61	11.9	15.85	22.02	PASS
	CH140	5700	13.55	10.9	15.43	22.36	PASS
	CH149	5745	11	11.24	14.13	28.02	PASS
	CH157	5785	11.12	11.72	14.44	28.02	PASS
	CH165	5825	10.69	12.09	14.46	28.02	PASS
802.11n (HT40)	CH38	5190	8.53	10.06	12.37	22.02	PASS
	CH46	5230	7.75	9.78	11.89	22.02	PASS

	CH54	5270	8.01	8.23	11.13	22.02	PASS
	CH62	5310	7.85	6.99	10.45	22.02	PASS
	CH102	5510	11.71	10.23	14.04	22.02	PASS
	CH118	5590	13.69	11.85	15.88	22.02	PASS
	CH134	5670	13.35	10.67	15.22	22.02	PASS
	CH151	5755	11	11.29	14.16	28.02	PASS
	CH159	5795	10.77	11.7	14.27	28.02	PASS
802.11ac (VHT40)	CH38	5190	9.44	10.12	12.8	22.02	PASS
	CH46	5230	8.88	9.79	12.37	22.02	PASS
	CH54	5270	8.12	8.3	11.22	22.02	PASS
	CH62	5310	6.85	7.91	10.42	22.02	PASS
	CH102	5510	11.72	10.11	14	22.02	PASS
	CH118	5590	13.73	11.87	15.91	22.02	PASS
	CH134	5670	13.34	10.71	15.23	22.02	PASS
	CH151	5755	10.7	11.24	13.99	28.02	PASS
	CH159	5795	10.67	11.61	14.18	28.02	PASS
802.11ac (VHT80)	CH42	5210	8.01	10.65	12.54	22.02	PASS
	CH58	5290	8.56	7.83	11.22	22.02	PASS
	CH106	5530	10.93	9.94	13.47	22.02	PASS
	CH122	5610	12.15	9.49	14.03	22.02	PASS
	CH155	5775	11.34	11.89	14.63	28.02	PASS

Antenna 1:

Operating Mode	Test Channel	Tune up tolerance (dBm)	Max tune up conducted power (dBm)	Output Peak power (mW)	Ant. Gain (dBi)	Ant. Gain (numeric)	Power density at 20cm (mW/cm ²)	Power density Limits (mW/cm ²)
802.11a	CH36	10 ± 1	11	12.589	4.97	3.141	0.007865	1
	CH40	9 ± 1	10	10.000	4.97	3.141	0.006248	1
	CH48	8 ± 1	9	7.943	4.97	3.141	0.004963	1
	CH52	9 ± 1	10	10.000	4.97	3.141	0.006248	1
	CH60	7 ± 1	8	6.310	4.97	3.141	0.003942	1
	CH64	9 ± 1	10	10.000	4.97	3.141	0.006248	1
	CH100	13 ± 1	14	25.119	4.97	3.141	0.015694	1
	CH120	13 ± 1	14	25.119	4.97	3.141	0.015694	1
	CH140	12 ± 1	13	19.953	4.97	3.141	0.012466	1
	CH149	12 ± 1	13	19.953	4.97	3.141	0.012466	1
	CH157	13 ± 1	14	25.119	4.97	3.141	0.015694	1
	CH165	10 ± 1	11	12.589	4.97	3.141	0.007865	1
802.11n (VHT20)	CH36	9 ± 1	10	10.000	4.97	3.141	0.006248	1
	CH40	9 ± 1	10	10.000	4.97	3.141	0.006248	1
	CH48	9 ± 1	10	10.000	4.97	3.141	0.006248	1
	CH52	9 ± 1	10	10.000	4.97	3.141	0.006248	1
	CH60	8 ± 1	9	7.943	4.97	3.141	0.004963	1
	CH64	8 ± 1	9	7.943	4.97	3.141	0.004963	1
	CH100	14 ± 1	15	31.623	4.97	3.141	0.019757	1
	CH120	14 ± 1	15	31.623	4.97	3.141	0.019757	1
	CH140	14 ± 1	15	31.623	4.97	3.141	0.019757	1
	CH149	11 ± 1	12	15.849	4.97	3.141	0.009902	1
	CH157	11 ± 1	12	15.849	4.97	3.141	0.009902	1
	CH165	10 ± 1	11	12.589	4.97	3.141	0.007865	1
802.11ac (VHT20)	CH36	9 ± 1	10	10.000	4.97	3.141	0.006248	1
	CH40	9 ± 1	10	10.000	4.97	3.141	0.006248	1
	CH48	9 ± 1	10	10.000	4.97	3.141	0.006248	1
	CH52	8 ± 1	9	7.943	4.97	3.141	0.004963	1
	CH60	8 ± 1	9	7.943	4.97	3.141	0.004963	1
	CH64	8 ± 1	9	7.943	4.97	3.141	0.004963	1
	CH100	13 ± 1	14	25.119	4.97	3.141	0.015694	1
	CH120	14 ± 1	15	31.623	4.97	3.141	0.019757	1
	CH140	14 ± 1	15	31.623	4.97	3.141	0.019757	1
	CH149	11 ± 1	12	15.849	4.97	3.141	0.009902	1
	CH157	11 ± 1	12	15.849	4.97	3.141	0.009902	1

	CH165	11±1	12	15.849	4.97	3.141	0.009902	1
802.11n (VHT40)	CH38	9±1	10	10.000	4.97	3.141	0.006248	1
	CH46	8±1	9	7.943	4.97	3.141	0.004963	1
	CH54	8±1	9	7.943	4.97	3.141	0.004963	1
	CH62	8±1	9	7.943	4.97	3.141	0.004963	1
	CH102	12±1	13	19.953	4.97	3.141	0.012466	1
	CH118	14±1	15	31.623	4.97	3.141	0.019757	1
	CH134	13±1	14	25.119	4.97	3.141	0.015694	1
	CH151	11±1	12	15.849	4.97	3.141	0.009902	1
	CH159	11±1	12	15.849	4.97	3.141	0.009902	1
802.11 ac (VHT40)	CH38	9±1	10	10.000	4.97	3.141	0.006248	1
	CH46	9±1	10	10.000	4.97	3.141	0.006248	1
	CH54	8±1	9	7.943	4.97	3.141	0.004963	1
	CH62	7±1	8	6.310	4.97	3.141	0.003942	1
	CH102	12±1	13	19.953	4.97	3.141	0.012466	1
	CH118	14±1	15	31.623	4.97	3.141	0.019757	1
	CH134	13±1	14	25.119	4.97	3.141	0.015694	1
	CH151	11±1	12	15.849	4.97	3.141	0.009902	1
	CH159	11±1	12	15.849	4.97	3.141	0.009902	1
802.11 ac (VHT80)	CH42	8±1	9	7.943	4.97	3.141	0.004963	1
	CH58	9±1	10	10.000	4.97	3.141	0.006248	1
	CH106	11±1	12	15.849	4.97	3.141	0.009902	1
	CH122	12±1	13	19.953	4.97	3.141	0.012466	1
	CH155	11±1	12	15.849	4.97	3.141	0.009902	1

Antenna 2:

Operating Mode	Test Channel	Tune up tolerance (dBm)	Max tune up conducted power(dBm)	Output Peak power (mW)	Ant. Gain (dBi)	Ant. Gain (numeric)	Power density at 20cm (mW/cm ²)	Power density Limits (mW/cm ²)
802.11a	CH36	10±1	11	12.589	4.97	3.141	0.007865	1
	CH40	9±1	10	10.000	4.97	3.141	0.006248	1
	CH48	8±1	9	7.943	4.97	3.141	0.004963	1
	CH52	8±1	9	7.943	4.97	3.141	0.004963	1
	CH60	9±1	10	10.000	4.97	3.141	0.006248	1
	CH64	8±1	9	7.943	4.97	3.141	0.004963	1
	CH100	12±1	13	19.953	4.97	3.141	0.012466	1
	CH120	11±1	12	15.849	4.97	3.141	0.009902	1
	CH140	11±1	12	15.849	4.97	3.141	0.009902	1
	CH149	11±1	12	15.849	4.97	3.141	0.009902	1
	CH157	12±1	13	19.953	4.97	3.141	0.012466	1
	CH165	12±1	13	19.953	4.97	3.141	0.012466	1
802.11n (VHT20)	CH36	10±1	11	12.589	4.97	3.141	0.007865	1
	CH40	9±1	10	10.000	4.97	3.141	0.006248	1
	CH48	9±1	10	10.000	4.97	3.141	0.006248	1
	CH52	8±1	9	7.943	4.97	3.141	0.004963	1
	CH60	8±1	9	7.943	4.97	3.141	0.004963	1
	CH64	8±1	9	7.943	4.97	3.141	0.004963	1
	CH100	11±1	12	15.849	4.97	3.141	0.009902	1
	CH120	11±1	12	15.849	4.97	3.141	0.009902	1
	CH140	11±1	12	15.849	4.97	3.141	0.009902	1
	CH149	11±1	12	15.849	4.97	3.141	0.009902	1
	CH157	12±1	13	19.953	4.97	3.141	0.012466	1
	CH165	12±1	13	19.953	4.97	3.141	0.012466	1
802.11ac (VHT20)	CH36	10±1	11	12.589	4.97	3.141	0.007865	1
	CH40	10±1	11	12.589	4.97	3.141	0.007865	1
	CH48	10±1	11	12.589	4.97	3.141	0.007865	1
	CH52	8±1	9	7.943	4.97	3.141	0.004963	1
	CH60	8±1	9	7.943	4.97	3.141	0.004963	1
	CH64	8±1	9	7.943	4.97	3.141	0.004963	1
	CH100	12±1	13	19.953	4.97	3.141	0.012466	1
	CH120	12±1	13	19.953	4.97	3.141	0.012466	1
	CH140	11±1	12	15.849	4.97	3.141	0.009902	1
	CH149	11±1	12	15.849	4.97	3.141	0.009902	1
	CH157	12±1	13	19.953	4.97	3.141	0.012466	1
	CH165	12±1	13	19.953	4.97	3.141	0.012466	1

802.11n (VHT40)	CH38	10±1	11	12.589	4.97	3.141	0.007865	1
	CH46	10±1	11	12.589	4.97	3.141	0.007865	1
	CH54	8±1	9	7.943	4.97	3.141	0.004963	1
	CH62	7±1	8	6.310	4.97	3.141	0.003942	1
	CH102	10±1	11	12.589	4.97	3.141	0.007865	1
	CH118	12±1	13	19.953	4.97	3.141	0.012466	1
	CH134	11±1	12	15.849	4.97	3.141	0.009902	1
	CH151	11±1	12	15.849	4.97	3.141	0.009902	1
	CH159	12±1	13	19.953	4.97	3.141	0.012466	1
802.11ac (VHT40)	CH38	10±1	11	12.589	4.97	3.141	0.007865	1
	CH46	10±1	11	12.589	4.97	3.141	0.007865	1
	CH54	8±1	9	7.943	4.97	3.141	0.004963	1
	CH62	8±1	9	7.943	4.97	3.141	0.004963	1
	CH102	10±1	11	12.589	4.97	3.141	0.007865	1
	CH118	12±1	13	19.953	4.97	3.141	0.012466	1
	CH134	11±1	12	15.849	4.97	3.141	0.009902	1
	CH151	11±1	12	15.849	4.97	3.141	0.009902	1
	CH159	12±1	13	19.953	4.97	3.141	0.012466	1
802.11ac (VHT80)	CH42	11±1	12	15.849	4.97	3.141	0.009902	1
	CH58	8±1	9	7.943	4.97	3.141	0.004963	1
	CH106	10±1	11	12.589	4.97	3.141	0.007865	1
	CH122	9±1	10	10.000	4.97	3.141	0.006248	1
	CH155	12±1	13	19.953	4.97	3.141	0.012466	1

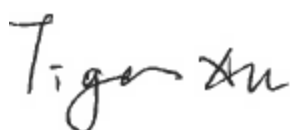
MPE Result:

Operation Mode	Channel Number	Channel Frequency (MHz)	Power density at 20cm (mW/cm ²)			Power density Limits (mW/cm ²)	Verdict
			Ant1	Ant2	Sum		
802.11a	CH36	5180	0.007865	0.007865	--	1	PASS
	CH40	5200	0.006248	0.006248	--	1	PASS
	CH48	5240	0.004963	0.004963	--	1	PASS
	CH52	5260	0.006248	0.004963	--	1	PASS
	CH60	5300	0.003942	0.006248	--	1	PASS
	CH64	5320	0.006248	0.004963	--	1	PASS
	CH100	5500	0.015694	0.012466	--	1	PASS
	CH120	5600	0.015694	0.009902	--	1	PASS
	CH140	5700	0.012466	0.009902	--	1	PASS
	CH149	5745	0.012466	0.009902	--	1	PASS
	CH157	5785	0.015694	0.012466	--	1	PASS
	CH165	5825	0.007865	0.012466	--	1	PASS
802.11n (HT20)	CH36	5180	0.006248	0.007865	0.014113	1	PASS
	CH40	5200	0.006248	0.006248	0.012496	1	PASS
	CH48	5240	0.006248	0.006248	0.012496	1	PASS
	CH52	5260	0.006248	0.004963	0.011211	1	PASS
	CH60	5300	0.004963	0.004963	0.009926	1	PASS
	CH64	5320	0.004963	0.004963	0.009926	1	PASS
	CH100	5500	0.019757	0.009902	0.029659	1	PASS
	CH120	5600	0.019757	0.009902	0.029659	1	PASS
	CH140	5700	0.019757	0.009902	0.029659	1	PASS
	CH149	5745	0.009902	0.009902	0.019804	1	PASS
	CH157	5785	0.009902	0.012466	0.022368	1	PASS
	CH165	5825	0.007865	0.012466	0.020331	1	PASS
802.11ac (VHT20)	CH36	5180	0.006248	0.007865	0.014113	1	PASS
	CH40	5200	0.006248	0.007865	0.014113	1	PASS
	CH48	5240	0.006248	0.007865	0.014113	1	PASS
	CH52	5260	0.004963	0.004963	0.009926	1	PASS
	CH60	5300	0.004963	0.004963	0.009926	1	PASS
	CH64	5320	0.004963	0.004963	0.009926	1	PASS
	CH100	5500	0.015694	0.012466	0.02816	1	PASS
	CH120	5600	0.019757	0.012466	0.032223	1	PASS
	CH140	5700	0.019757	0.009902	0.029659	1	PASS
	CH149	5745	0.009902	0.009902	0.019804	1	PASS
	CH157	5785	0.009902	0.012466	0.022368	1	PASS
	CH165	5825	0.009902	0.012466	0.022368	1	PASS

802.11n (HT40)	CH38	5190	0.006248	0.007865	0.014113	1	PASS
	CH46	5230	0.004963	0.007865	0.012828	1	PASS
	CH54	5270	0.004963	0.004963	0.009926	1	PASS
	CH62	5310	0.004963	0.003942	0.008905	1	PASS
	CH102	5510	0.012466	0.007865	0.020331	1	PASS
	CH118	5590	0.019757	0.012466	0.032223	1	PASS
	CH134	5670	0.015694	0.009902	0.025596	1	PASS
	CH151	5755	0.009902	0.009902	0.019804	1	PASS
802.11ac (VHT40)	CH38	5190	0.006248	0.007865	0.014113	1	PASS
	CH46	5230	0.006248	0.007865	0.014113	1	PASS
	CH54	5270	0.004963	0.004963	0.009926	1	PASS
	CH62	5310	0.003942	0.004963	0.008905	1	PASS
	CH102	5510	0.012466	0.007865	0.020331	1	PASS
	CH118	5590	0.019757	0.012466	0.032223	1	PASS
	CH134	5670	0.015694	0.009902	0.025596	1	PASS
	CH151	5755	0.009902	0.009902	0.019804	1	PASS
802.11ac (VHT80)	CH159	5795	0.009902	0.012466	0.022368	1	PASS
	CH42	5210	0.004963	0.009902	0.014865	1	PASS
	CH58	5290	0.006248	0.004963	0.011211	1	PASS
	CH106	5530	0.009902	0.007865	0.017767	1	PASS
	CH122	5610	0.012466	0.006248	0.018714	1	PASS
	CH155	5775	0.009902	0.012466	0.022368	1	PASS

The Product unsupported at the same time to Transmitting. According to KDB 447498, and no simultaneous SAR measurement is required.

Signature:



Tiger Xu

Date: 2023-08-10