

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: 2A22Z-W331H

EUT Specification

EUT	Outdoor Battery Cameras (Wi-Fi HomeBase)
Model Number	W331-H
Rating	DC 12V, 2A
Frequency band (Operating)	<input checked="" type="checkbox"/> BT: 2.402GHz ~ 2.480GHz <input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input checked="" type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input checked="" type="checkbox"/> WLAN: 5.745GHz ~ 5825GHz
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation)
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm ²) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm ²)
Antenna diversity	<input type="checkbox"/> Single antenna <input checked="" type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
Max. output power (peak power)	BLE: 1.74 dBm 802.11b: 14.58 dBm 802.11g: 14.07 dBm 802.11n-HT20: 15.65 dBm 802.11n-HT40: 15.06 dBm 5180 MHz to 5240 MHz: 15.93 dBm 5260 MHz to 5320 MHz: 15.48 dBm 5500 MHz to 5700 MHz: 16.50 dBm 5745 MHz to 5825 MHz: 12.11 dBm
Antenna gain (Max)	BT: 3.54 dBi 2.4GHz WIFI: Antenna 1: 3.4 dBi, Antenna 2: 3.92 dBi 5G WIFI:5.82 dBi
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> 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: $P_d = \frac{P_{out} * G}{4 * \pi * R^2}$

Where

P_d = Power density in mW/cm², P_{out} = output power to antenna in Mw

G = gain of antenna in linear scale, $\pi = 3.1416$

R = distance between observation point and center of the radiator in cm = 20cm

P_d the limit of MPE, 1mW/cm². 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

Mode	Max Measure d Power (dBm)	Tune up Power (dBm)	Max tune up power(dBm)	Power Density(m W/cm ²)	Limit (mW/cm ²)
BLE	1.74	2±1	3	0.000897	1

2.4GHz WIFI:

Operation Mode	Channel Number	Channel Frequency (MHz)	Measurement Level (dBm)			Limit (dBm)	Verdict
			Ant1	Ant2	Sum		
802.11b	1	2412	14.45	14.39	--	30	PASS
	6	2437	14.34	14.42	--	30	PASS
	11	2462	14.46	14.56	--	30	PASS
802.11g	1	2412	13.32	13.19	--	30	PASS
	6	2437	13.58	13.19	--	30	PASS
	11	2462	13.01	13.34	--	30	PASS
802.11n (HT20)	1	2412	12.41	12.07	15.25	30	PASS
	6	2437	12.48	12.22	15.36	30	PASS
	11	2462	11.83	11.91	14.88	30	PASS
802.11n (HT40)	3	2422	10.93	10.82	13.89	30	PASS
	6	2437	10.8	10.48	13.65	30	PASS
	9	2452	10.91	10.32	13.64	30	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)
802.11b	1	14 ± 1	15	31.623	3.4	2.188	0.013763	1
	6	14 ± 1	15	31.623	3.4	2.188	0.013763	1
	11	14 ± 1	15	31.623	3.4	2.188	0.013763	1
802.11g	1	13 ± 1	14	25.119	3.4	2.188	0.010933	1
	6	14 ± 1	15	31.623	3.4	2.188	0.013763	1
	11	13 ± 1	14	25.119	3.4	2.188	0.010933	1
802.11n (HT20)	1	12 ± 1	13	19.953	3.4	2.188	0.008684	1
	6	12 ± 1	13	19.953	3.4	2.188	0.008684	1
	11	12 ± 1	13	19.953	3.4	2.188	0.008684	1
802.11n (HT40)	3	11 ± 1	12	15.849	3.4	2.188	0.006898	1
	6	11 ± 1	12	15.849	3.4	2.188	0.006898	1
	9	11 ± 1	12	15.849	3.4	2.188	0.006898	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)
802.11b	1	14 ± 1	15	31.623	3.92	2.466	0.015514	1
	6	14 ± 1	15	31.623	3.92	2.466	0.015514	1
	11	15 ± 1	16	39.811	3.92	2.466	0.019531	1
802.11g	1	13 ± 1	14	25.119	3.92	2.466	0.012323	1
	6	13 ± 1	14	25.119	3.92	2.466	0.012323	1
	11	13 ± 1	14	25.119	3.92	2.466	0.012323	1
802.11n (HT20)	1	12 ± 1	13	19.953	3.92	2.466	0.009789	1
	6	12 ± 1	13	19.953	3.92	2.466	0.009789	1
	11	12 ± 1	13	19.953	3.92	2.466	0.009789	1
802.11n (HT40)	3	11 ± 1	12	15.849	3.92	2.466	0.007775	1
	6	10 ± 1	11	12.589	3.92	2.466	0.006176	1
	9	10 ± 1	11	12.589	3.92	2.466	0.006176	1

Antenna 1 + Antenna 2:

Operation Mode	Channel Number	Channel Frequency (MHz)	Power density at 20cm (mW/ cm ²)			Power density Limits (mW/cm ²)	Verdict
			Ant1	Ant2	Sum		
802.11b	1	2412	0.01376	0.01551	--	1	PASS
	6	2437	0.01376	0.01551	--	1	PASS
	11	2462	0.01376	0.01953	--	1	PASS
802.11g	1	2412	0.01093	0.01232	--	1	PASS
	6	2437	0.01376	0.01232	--	1	PASS
	11	2462	0.01093	0.01232	--	1	PASS
802.11n (HT20)	1	2412	0.00868	0.00979	0.018473	1	PASS
	6	2437	0.00868	0.00979	0.018473	1	PASS
	11	2462	0.00868	0.00979	0.018473	1	PASS
802.11n (HT40)	3	2422	0.0069	0.00778	0.014673	1	PASS
	6	2437	0.0069	0.00618	0.013074	1	PASS
	9	2452	0.0069	0.00618	0.013074	1	PASS

5.8GHz WIFI:

Operation Mode	Channel Number	Channel Frequency (MHz)	Measurement Level (dBm)	Limit (dBm)	Verdict
			Ant1		
802.11a	CH36	5180	15.93	24	PASS
	CH40	5200	15.48	24	PASS
	CH48	5240	15.55	24	PASS
	CH52	5260	15.48	24	PASS
	CH60	5300	14.98	24	PASS
	CH64	5320	14.18	24	PASS
	CH100	5500	15.09	24	PASS
	CH120	5600	16.5	24	PASS
	CH140	5700	14.1	24	PASS
	CH149	5745	12.11	30	PASS
	CH157	5785	11.33	30	PASS
CH165	5825	10.89	30	PASS	
802.11n (HT20)	CH36	5180	15.25	24	PASS
	CH40	5200	15.35	24	PASS
	CH48	5240	15.44	24	PASS
	CH52	5260	15.16	24	PASS
	CH60	5300	14.77	24	PASS
	CH64	5320	14.17	24	PASS
	CH100	5500	14.43	24	PASS
	CH120	5600	14.32	24	PASS
	CH140	5700	13.14	24	PASS
	CH149	5745	11.84	30	PASS
	CH157	5785	11.24	30	PASS
CH165	5825	10.82	30	PASS	
802.11ac (VHT20)	CH36	5180	15.27	24	PASS
	CH40	5200	15.36	24	PASS
	CH48	5240	15.5	24	PASS
	CH52	5260	15.25	24	PASS
	CH60	5300	14.89	24	PASS
	CH64	5320	14.1	24	PASS
	CH100	5500	10.95	24	PASS
	CH120	5600	13.44	24	PASS
	CH140	5700	10.98	24	PASS
	CH149	5745	10.91	30	PASS
	CH157	5785	11.2	30	PASS
CH165	5825	10.75	30	PASS	
802.11ax (HE20)	CH36	5180	15.22	24	PASS
	CH40	5200	15.38	24	PASS

	CH48	5240	15.5	24	PASS
	CH52	5260	15.24	24	PASS
	CH60	5300	14.9	24	PASS
	CH64	5320	14.53	24	PASS
	CH100	5500	11.34	24	PASS
	CH120	5600	13.3	24	PASS
	CH140	5700	10.93	24	PASS
	CH149	5745	11.71	30	PASS
	CH157	5785	11.14	30	PASS
	CH165	5825	10.77	30	PASS
802.11n (HT40)	CH38	5190	15.11	24	PASS
	CH46	5230	12.41	24	PASS
	CH54	5270	15.09	24	PASS
	CH62	5310	14.35	24	PASS
	CH102	5510	11.42	24	PASS
	CH118	5590	13.11	24	PASS
	CH134	5670	11.95	24	PASS
	CH151	5755	11.45	30	PASS
	CH159	5795	11.14	30	PASS
802.11ac (VHT40)	CH38	5190	12.1	24	PASS
	CH46	5230	12.21	24	PASS
	CH54	5270	12.18	24	PASS
	CH62	5310	11.36	24	PASS
	CH102	5510	11.2	24	PASS
	CH118	5590	13.18	24	PASS
	CH134	5670	11.95	24	PASS
	CH151	5755	11.36	30	PASS
	CH159	5795	10.89	30	PASS
802.11ax (HE40)	CH38	5190	12.13	24	PASS
	CH46	5230	12.33	24	PASS
	CH54	5270	8.56	24	PASS
	CH62	5310	7.74	24	PASS
	CH102	5510	11.2	24	PASS
	CH118	5590	13.49	24	PASS
	CH134	5670	12.12	24	PASS
	CH151	5755	11.45	30	PASS
	CH159	5795	10.97	30	PASS

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	16±1	17	50.19	5.82	3.819	0.038082	1
	CH40	15±1	16	39.811	5.82	3.819	0.030250	1
	CH48	16±1	17	50.19	5.82	3.819	0.038082	1
	CH52	15±1	16	39.811	5.82	3.819	0.030250	1
	CH60	15±1	16	39.811	5.82	3.819	0.030250	1
	CH64	14±1	15	31.623	5.82	3.819	0.024028	1
	CH100	15±1	16	39.811	5.82	3.819	0.030250	1
	CH120	17±1	18	63.096	5.82	3.819	0.047942	1
	CH140	14±1	15	31.623	5.82	3.819	0.024028	1
	CH149	12±1	13	19.953	5.82	3.819	0.015161	1
	CH157	11±1	12	15.849	5.82	3.819	0.012043	1
	CH165	11±1	12	15.849	5.82	3.819	0.012043	1
802.11n (VHT20)	CH36	15±1	16	39.811	5.82	3.819	0.030250	1
	CH40	15±1	16	39.811	5.82	3.819	0.030250	1
	CH48	15±1	16	39.811	5.82	3.819	0.030250	1
	CH52	15±1	16	39.811	5.82	3.819	0.030250	1
	CH60	15±1	16	39.811	5.82	3.819	0.030250	1
	CH64	14±1	15	31.6	5.8	3.819	0.0240	1

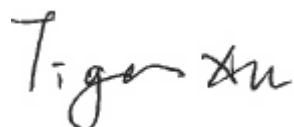
				23	2		28	
	CH10 0	14±1	15	31.6 23	5.8 2	3.819	0.0240 28	1
	CH12 0	14±1	15	31.6 23	5.8 2	3.819	0.0240 28	1
	CH14 0	13±1	14	25.1 19	5.8 2	3.819	0.0190 86	1
	CH14 9	12±1	13	19.9 53	5.8 2	3.819	0.0151 61	1
	CH15 7	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
	CH16 5	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
802.11 ac (VHT2 0)	CH36	15±1	16	39.8 11	5.8 2	3.819	0.0302 50	1
	CH40	15±1	16	39.8 11	5.8 2	3.819	0.0302 50	1
	CH48	16±1	17	50.1 19	5.8 2	3.819	0.0380 82	1
	CH52	15±1	16	39.8 11	5.8 2	3.819	0.0302 50	1
	CH60	15±1	16	39.8 11	5.8 2	3.819	0.0302 50	1
	CH64	14±1	15	31.6 23	5.8 2	3.819	0.0240 28	1
	CH10 0	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
	CH12 0	13±1	14	25.1 19	5.8 2	3.819	0.0190 86	1
	CH14 0	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
	CH14 9	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
	CH15 7	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
	CH16 5	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
802.11 ax (HE20)	CH36	15±1	16	39.8 11	5.8 2	3.819	0.0302 50	1
	CH40	15±1	16	39.8 11	5.8 2	3.819	0.0302 50	1
	CH48	16±1	17	50.1 19	5.8 2	3.819	0.0380 82	1

	CH52	15±1	16	39.8 11	5.8 2	3.819	0.0302 50	1
	CH60	15±1	16	39.8 11	5.8 2	3.819	0.0302 50	1
	CH64	15±1	16	39.8 11	5.8 2	3.819	0.0302 50	1
	CH10 0	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
	CH12 0	13±1	14	25.1 19	5.8 2	3.819	0.0190 86	1
	CH14 0	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
	CH14 9	12±1	13	19.9 53	5.8 2	3.819	0.0151 61	1
	CH15 7	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
	CH16 5	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
802.11n (VHT40)	CH38	15±1	16	39.8 11	5.8 2	3.819	0.0302 50	1
	CH46	12±1	13	19.9 53	5.8 2	3.819	0.0151 61	1
	CH54	15±1	16	39.8 11	5.8 2	3.819	0.0302 50	1
	CH62	14±1	15	31.6 23	5.8 2	3.819	0.0240 28	1
	CH10 2	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
	CH11 8	13±1	14	25.1 19	5.8 2	3.819	0.0190 86	1
	CH13 4	12±1	13	19.9 53	5.8 2	3.819	0.0151 61	1
	CH15 1	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
	CH15 9	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
802.11 ac (VHT4 0)	CH38	12±1	13	19.9 53	5.8 2	3.819	0.0151 61	1
	CH46	12±1	13	19.9 53	5.8 2	3.819	0.0151 61	1
	CH54	12±1	13	19.9 53	5.8 2	3.819	0.0151 61	1
	CH62	11±1	12	15.8	5.8	3.819	0.0120	1

				49	2		43	
	CH10 2	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
	CH11 8	13±1	14	25.1 19	5.8 2	3.819	0.0190 86	1
	CH13 4	12±1	13	19.9 53	5.8 2	3.819	0.0151 61	1
	CH15 1	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
	CH15 9	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
802.11 ax (HE40)	CH38	12±1	13	19.9 53	5.8 2	3.819	0.0151 61	1
	CH46	12±1	13	19.9 53	5.8 2	3.819	0.0151 61	1
	CH54	9±1	10	10.0 00	5.8 2	3.819	0.0075 98	1
	CH62	8±1	9	7.94 3	5.8 2	3.819	0.0060 36	1
	CH10 2	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
	CH11 8	13±1	14	25.1 19	5.8 2	3.819	0.0190 86	1
	CH13 4	12±1	13	19.9 53	5.8 2	3.819	0.0151 61	1
	CH15 1	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1
	CH15 9	11±1	12	15.8 49	5.8 2	3.819	0.0120 43	1

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

Signature:



Tiger Xu

Date: 2023-09-04