



FCC RF Exposure Evaluation

1. Product Information

FCC ID	2A6YQ-WF122
Product name	Sample BKW-WF122
Model number	WF122
Power supply	Input: DC 3.3V
Hardware version	/
Software version	/
FCC Operation frequency	2412~2462 MHz 5260-5320MHz, 5500-5700MHz
Channel Number	11 Channels for 20MHz bandwidth (2412~2462MHz) 7 Channels for 40MHz bandwidth (2422~2452MHz) 4 Channels for 20MHz bandwidth(5260MHz-5320MHz) 11 Channels for 20MHz bandwidth(5500MHz-5700MHz) 2 channels for 40MHz bandwidth(5270MHz~5310MHz) 5 Channels for 40MHz bandwidth(5510MHz-5670MHz) 1 channels for 80MHz bandwidth(5290MHz) 2 Channels for 80MHz bandwidth(5530MHz, 5610MHz)
Modulation Type	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11a/n/ac: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)
Antenna Type	Metal Shrapnel Antenna
Antenna Gain	2dBi(Max.)
Exposure category	General population/uncontrolled environment
EUT Type	Production Unit
Device Type	Mobile Devices



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2. Evaluation Method

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3. Limit

3.1 Refer Evaluation Method

[ANSI C95.1-1999](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

[FCC CFR 47 part1 1.1310](#): Radiofrequency radiation exposure limits.

[FCC CFR 47 part2 2.1091](#): Radiofrequency radiation exposure evaluation: mobile devices

3.2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	6
3.0 – 30	1842/f	4.89/f	(900/f ²)*	6
30 – 300	61.4	0.163	1.0	6
300 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	(180/f ²)*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30
1500 – 100,000	/	/	1.0	30

F=frequency in MHz

*=Plane-wave equivalent power density



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4. MPE Calculation Method

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4\pi R^2$$

Where: S=power density
P=power input to antenna
G=power gain of the antenna in the direction of interest relative to an isotropic radiator
R=distance to the center of radiation of the antenna

5. Antenna Information

Metal Shrapnel Antenna can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Note
Antenna	Metal Shrapnel Antenna	2400MHz-2500MHz 5260MHz-5700MHz	2dBi	WIFI Antenna

6. Conducted Power

<2.4G WIFI>

Mode	Channel	Frequency(MHz)	Max Conducted Power (dBm)
IEEE 802.11b	1	2412	16.88
	6	2437	17.5
	11	2462	17.11
IEEE 802.11g	1	2412	14.52
	6	2437	14.62
	11	2462	14.4
IEEE 802.11n HT20	1	2412	14.56
	6	2437	14.9
	11	2462	14.61
IEEE 802.11n HT40	3	2422	14.26
	6	2437	14.25
	9	2452	14.21

[5.3GHz WLAN]

Mode	Channel	Frequency (MHz)	Average Conducted Output Power (dBm)
IEEE 802.11a	52	5260	8.66
	60	5280	9.08
	64	5320	8.81
IEEE 802.11n HT20	52	5260	8.39
	60	5280	8.96
	64	5320	9.45
IEEE 802.11n HT40	54	5270	9.65
	62	5310	8.75
IEEE 802.11ac VHT20	52	5260	8.23
	60	5280	8.48
	64	5320	8.19
IEEE 802.11ac VHT40	54	5270	8.22
	62	5310	8.35
IEEE 802.11ac VHT80	58	5290	8.87



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[5.5GHz WLAN]

Mode	Channel	Frequency (MHz)	Average Conducted Output Power (dBm)
IEEE 802.11a	100	5500	6.57
	116	5580	5.22
	140	5700	5.98
IEEE 802.11n HT20	100	5500	6.99
	116	5580	6.00
	140	5700	6.80
IEEE 802.11n HT40	102	5510	7.36
	110	5550	6.78
	134	5670	6.51
IEEE 802.11ac VHT20	100	5500	5.53
	116	5580	5.00
	140	5700	5.28
IEEE 802.11ac VHT40	102	5510	5.34
	110	5550	5.27
	134	5670	5.15
IEEE 802.11ac VHT80	106	5530	6.92
	122	5610	7.09



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7. Manufacturing Tolerance

<2.4G WIFI>

11B (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	16.0	17.0	17.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11G (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	14.0	14.0	14.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N20SISO (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	14.0	14.0	14.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N40SISO (Peak)			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	14.0	14.0	14.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

[5.3GHz WLAN]

IEEE 802.11a (Average)			
Channel	Channel 52	Channel 60	Channel 64
Target (dBm)	8.0	9.0	8.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 52	Channel 60	Channel 64
Target (dBm)	8.0	8.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Average)			
Channel	Channel 54	Channel 62	
Target (dBm)	9.0	8.0	
Tolerance $\pm$ (dB)	1.0	1.0	
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 52	Channel 60	Channel 64
Target (dBm)	8.0	8.0	8.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 54	Channel 62	
Target (dBm)	8.0	8.0	
Tolerance $\pm$ (dB)	1.0	1.0	
IEEE 802.11ac VHT80(Average)			
Channel	Channel 58		
Target (dBm)	8.0		
Tolerance $\pm$ (dB)	1.0		



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[5.5GHz WLAN]			
IEEE 802.11a (Average)			
Channel	Channel 100	Channel 116	Channel 140
Target (dBm)	6.0	5.0	5
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 100	Channel 116	Channel 140
Target (dBm)	6.0	6.0	6.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Average)			
Channel	Channel 102	Channel 110	Channel 134
Target (dBm)	7.0	6.0	6.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 100	Channel 116	Channel 140
Target (dBm)	5.0	5.0	5.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 102	Channel 110	Channel 134
Target (dBm)	5.0	5.0	5.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT80(Average)			
Channel	Channel 106	Channel 122	
Target (dBm)	6.0	7.0	
Tolerance $\pm$ (dB)	1.0	1.0	



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8. Measurement Results

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r=20\text{cm}$, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

<2.4G WIFI>

Band/Mode	RF output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
IEEE 802.11b	18.0	63.0957	2	1.58	0.0199	1.0000
IEEE 802.11g	15.0	31.6228	2	1.58	0.0100	1.0000
IEEE 802.11n HT20	15.0	31.6228	2	1.58	0.0100	1.0000
IEEE 802.11n HT40	15.0	31.6228	2	1.58	0.0100	1.0000

[5.3GHz WLAN]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
IEEE 802.11a	10.0	10.0000	2	1.58	0.0032	1.0000
IEEE 802.11n HT20	10.0	10.0000	2	1.58	0.0032	1.0000
IEEE 802.11n HT40	10.0	10.0000	2	1.58	0.0032	1.0000
IEEE 802.11ac VHT20	9.0	7.9433	2	1.58	0.0025	1.0000
IEEE 802.11ac VHT40	9.0	7.9433	2	1.58	0.0025	1.0000
IEEE 802.11ac VHT80	9.0	7.9433	2	1.58	0.0025	1.0000

[5.5GHz WLAN]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
IEEE 802.11a	7.0	5.0119	2	1.58	0.0016	1.0000
IEEE 802.11n HT20	7.0	5.0119	2	1.58	0.0016	1.0000
IEEE 802.11n HT40	8.0	6.3096	2	1.58	0.0020	1.0000
IEEE 802.11ac VHT20	6.0	3.9811	2	1.58	0.0013	1.0000
IEEE 802.11ac VHT40	6.0	3.9811	2	1.58	0.0013	1.0000
IEEE 802.11ac VHT80	8.0	6.3096	2	1.58	0.0020	1.0000



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Remark:

1. Output power including tune-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer;

9. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

.....THE END OF REPORT.....

