



FCC RF Exposure Evaluation

1. Product Information

FCC ID	2BBWZ-KY6120
Product name	AI Dash Cam
Model number	KY-6120, KY6124
Power supply	Input: DC 12V/24V, 1.5A
Hardware version	KY6120-MAIN-A1
Software version	V2.1.18
WIFI(2.4G Band)	
FCC Operation frequency	2412~2462 MHz
Channel Number	11 Channels for 20MHz bandwidth (2412~2462MHz) 7 Channels for 40MHz bandwidth (2422~2452MHz)
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)
Antenna Type	FPC Antenna
Antenna Gain	2.4dBi(Max.)
LTE Module FCC ID	ZMOMC116NA
Product name	LTE Wireless Module
Model number	MC116-NA
LTE	
Support Band	☒ E-UTRA Band 2(U.S.-Band) 1850.7MHz -1909.3MHz ☒ E-UTRA Band 4(U.S.-Band) 1710.7MHz -1754.3MHz ☒ E-UTRA Band 5(U.S.-Band) 824.7MHz -848.3MHz ☒ E-UTRA Band 12(U.S.-Band) 699.7MHz -715.3MHz ☒ E-UTRA Band 13(U.S.-Band) 779.5MHz -784.5MHz ☒ E-UTRA Band 17(U.S.-Band) 706.5MHz -713.5MHz ☒ E-UTRA Band 66(U.S.-Band) 1710.7MHz -1779.3MHz
LTE Release Version	R8
Type Of Modulation	QPSK/16QAM/ 64QAM (DL only)
Antenna Description	Internal Antenna 7.5dBi (max.) For E-UTRA Band 2 5.0dBi (max.) For E-UTRA Band 4 5.0dBi (max.) For E-UTRA Band 5 4.5dBi (max.) For E-UTRA Band 12 4.5dBi (max.) For E-UTRA Band 13 4.5dBi (max.) For E-UTRA Band 17 5.0dBi (max.) For E-UTRA Band 66
Power Class	Class 3



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Exposure category	General population/uncontrolled environment
EUT Type	Production Unit
Device Type	Mobile Devices





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

FPC 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	FPC Antenna	2412MHz-2462MHz	2.4dBi	WIFI Antenna
Internal	Internal Antenna	1850.7MHz -1909.3MHz	7.5dBi	LTE Antenna
		1710.7MHz -1754.3MHz	5.0dBi	
		824.7MHz -848.3MHz	5.0dBi	
		699.7MHz -715.3MHz	4.5dBi	
		779.5MHz -784.5MHz	4.5dBi	
		706.5MHz -713.5MHz	4.5dBi	
		1710.7MHz -1779.3MHz	5.0dBi	

6. Conducted Power

<2.4G WIFI>

Mode	Channel	Frequency(MHz)	Max Conducted Power (dBm)	ANT Max. Tune Up Power (dBm)
IEEE 802.11b	1	2412	17.69	17.0±1.0
	6	2437	17.55	17.0±1.0
	11	2462	17.15	17.0±1.0
IEEE 802.11g	1	2412	19.54	19.0±1.0
	6	2437	19.30	19.0±1.0
	11	2462	17.24	17.0±1.0
IEEE 802.11n HT20	1	2412	18.41	18.0±1.0
	6	2437	19.26	19.0±1.0
	11	2462	18.91	18.0±1.0
IEEE 802.11n HT40	3	2422	17.09	17.0±1.0
	6	2437	16.80	16.0±1.0
	9	2452	16.34	16.0±1.0





[LTE]

Test Mode		Frequency(MHz)	Max Average Power (dBm)	ANT Max. Tune Up Power (dBm)
LTE	Band 2	1850.7	25.00	25.00
	Band 4	1710.7	25.00	25.00
	Band 5	824.7	25.00	25.00
	Band 12	699.7	25.00	25.00
	Band 13	779.5	25.00	25.00
	Band 17	706.5	25.00	25.00
	Band 66	1710.7	25.00	25.00

7. Measurement Results

7.1 Standalone MPE Evaluation

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	2.4	1.7378	0.0218	1.0000
IEEE 802.11g	20.0	100.0000	2.4	1.7378	0.0346	1.0000
IEEE 802.11n HT20	20.0	100.0000	2.4	1.7378	0.0346	1.0000
IEEE 802.11n HT40	18.0	63.0957	2.4	1.7378	0.0218	1.0000

<LTE>

Band/Mode	RF output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
LTE Band 2	25.00	316.2278	7.5	5.6234	0.353957	1.0000
LTE Band 4	25.00	316.2278	5	3.1623	0.199045	1.0000
LTE Band 5	25.00	316.2278	5	3.1623	0.199045	0.5667
LTE Band 12	25.00	316.2278	4.5	2.8184	0.177399	0.4660
LTE Band 13	25.00	316.2278	4.5	2.8184	0.177399	0.5180
LTE Band 17	25.00	316.2278	4.5	2.8184	0.177399	0.4893
LTE Band 66	25.00	316.2278	5	3.1623	0.199045	1.0000

Remark:

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



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7.2 Simultaneous Transmission MPE Evaluation

The sample support one 2.4GWLAN, another one LTE transmit antenna, so need consider simultaneous transmission;

2.4GWLAN cannot work with LTE at the same time

Simultaneous transmission MPE

According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;

$\sum \sum$ of MPE ratios ≤ 1.0

Mode	MPE1 Max.	MPE2 Max.	$\sum$ MPE ratios	Limit	Results
2.4GWIFI+LTE	0.0346	0.380685	0.415285	1.000	Pass

8. 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.....



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