Maximum Permissible Exposure Report

1.Product Information

EUT	:Motorcycle DVR Dash Camera
Model Number	:HM702,HM603
Model Declaration	:All the same except for the model name.
Test Model	:HM702
Power Supply	:DC 9-36V
Hardware version	:HFK_M35_M17_Main_V0.2_231020
Software version	:M35-2024-01-30-V1.1

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

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

Antenna Gain and type refer to Antenna specification

6. Conducted Power

2.4G Band:
WiFi 2.4GHz Band

Test Mode	Antenna	Frequency[MHz]	Result [dBm]	Verdict
11B	Ant1	2412	16.23	PASS
11B	Ant2	2412	12.26	PASS
11B	Ant1	2437	15.50	PASS
11B	Ant2	2437	11.73	PASS
11B	Ant1	2462	16.29	PASS
11B	Ant2	2462	11.42	PASS
11G	Ant1	2412	16.59	PASS
11G	Ant2	2412	13.80	PASS
11G	Ant2	2437	12.88	PASS
11G	Ant1	2437	16.02	PASS
11G	Ant2	2462	12.85	PASS
11G	Ant1	2462	16.41	PASS
11N20MIMO	Ant1	2412	14.15	PASS
11N20MIMO	Ant2	2412	11.26	PASS
11N20MIMO	total	2412	15.95	PASS
11N20MIMO	Ant1	2437	13.70	PASS
11N20MIMO	Ant2	2437	10.01	PASS
11N20MIMO	total	2437	15.25	PASS
11N20MIMO	Ant1	2462	13.99	PASS
11N20MIMO	Ant2	2462	10.16	PASS
11N20MIMO	total	2462	15.49	PASS
11N40MIMO	Ant1	2422	14.53	PASS
11N40MIMO	Ant2	2422	11.00	PASS
11N40MIMO	total	2422	16.12	PASS
11N40MIMO	Ant1	2437	14.09	PASS
11N40MIMO	Ant2	2437	10.68	PASS
11N40MIMO	total	2437	15.72	PASS
11N40MIMO	Ant1	2452	14.15	PASS
11N40MIMO	Ant2	2452	10.26	PASS
11N40MIMO	total	2452	15.64	PASS

5G Band
UNII-1 Band

Test Mode	Antenna	Frequency[MHz]	Result [dBm]
11A	Ant1	5180	14.37
11A	Ant2	5180	13.83
11A	Ant1	5200	13.69
11A	Ant2	5200	13.33
11A	Ant1	5240	14.89
11A	Ant2	5240	14.49
11N20MIMO	Ant1	5180	13.91
11N20MIMO	Ant2	5180	13.63
11N20MIMO	total	5180	16.78
11N20MIMO	Ant1	5200	11.42
11N20MIMO	Ant2	5200	11.08
11N20MIMO	total	5200	14.26
11N20MIMO	Ant1	5240	12.71
11N20MIMO	Ant2	5240	12.16
11N20MIMO	total	5240	15.45
11N40MIMO	Ant1	5190	11.40
11N40MIMO	Ant2	5190	10.68
11N40MIMO	total	5190	14.07
11N40MIMO	Ant1	5230	12.28
11N40MIMO	Ant2	5230	11.67
11N40MIMO	total	5230	15.00
11AC20MIMO	Ant1	5180	13.99
11AC20MIMO	Ant2	5180	13.51
11AC20MIMO	total	5180	16.77
11AC20MIMO	Ant1	5200	10.06
11AC20MIMO	Ant2	5200	9.70
11AC20MIMO	total	5200	12.89
11AC20MIMO	Ant1	5240	11.63
11AC20MIMO	Ant2	5240	11.39
11AC20MIMO	total	5240	14.52
11AC40MIMO	Ant1	5190	11.51
11AC40MIMO	Ant2	5190	10.91
11AC40MIMO	total	5190	14.23
11AC40MIMO	Ant1	5230	12.37
11AC40MIMO	Ant2	5230	11.74
11AC40MIMO	total	5230	15.08
11AC80MIMO	Ant1	5210	12.13
11AC80MIMO	Ant2	5210	11.46
11AC80MIMO	total	5210	14.82

UNII-3 Band

Test Mode	Antenna	Frequency[MHz]	Result [dBm]
11A	Ant1	5745	16.37
11A	Ant2	5745	15.51
11A	Ant1	5785	15.38
11A	Ant2	5785	14.20
11A	Ant1	5825	14.18
11A	Ant2	5825	13.30
11N20MIMO	Ant1	5745	9.72
11N20MIMO	Ant2	5745	8.82
11N20MIMO	total	5745	12.30
11N20MIMO	Ant1	5785	10.80
11N20MIMO	Ant2	5785	9.67
11N20MIMO	total	5785	13.28
11N20MIMO	Ant1	5825	9.72
11N20MIMO	Ant2	5825	8.70
11N20MIMO	total	5825	12.25
11N40MIMO	Ant1	5755	11.42
11N40MIMO	Ant2	5755	10.60
11N40MIMO	total	5755	14.04
11N40MIMO	Ant1	5795	10.95
11N40MIMO	Ant2	5795	9.26
11N40MIMO	total	5795	13.20
11AC20MIMO	Ant1	5745	10.62
11AC20MIMO	Ant2	5745	9.85
11AC20MIMO	total	5745	13.26
11AC20MIMO	Ant1	5785	9.85
11AC20MIMO	Ant2	5785	8.61
11AC20MIMO	total	5785	12.28
11AC20MIMO	Ant1	5825	8.38
11AC20MIMO	Ant2	5825	7.15
11AC20MIMO	total	5825	10.82
11AC40MIMO	Ant1	5755	8.35
11AC40MIMO	Ant2	5755	7.52
11AC40MIMO	total	5755	10.97
11AC40MIMO	Ant1	5795	10.08
11AC40MIMO	Ant2	5795	9.33
11AC40MIMO	total	5795	12.73
11AC80MIMO	Ant1	5775	11.28
11AC80MIMO	Ant2	5775	9.18
11AC80MIMO	total	5775	13.37

7. Manufacturing Tolerance

WiFi 2.4GHz Band – Antenna 1

IEEE 802.11b(Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	15.5	15.0	16.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11g (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	16.0	12.5	12.5
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	13.5	13.0	13.5
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Average)			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	14.0	13.5	13.5
Tolerance ±(dB)	1.0	1.0	1.0

WiFi 2.4GHz Band – Antenna 2

IEEE 802.11b (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	12.0	11.0	11.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11g (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	13.5	15.5	16.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	11.0	9.5	9.5
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Average)			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	10.5	10.5	10.5
Tolerance ±(dB)	1.0	1.0	1.0

UNII-1 Band – Antenna 1

IEEE 802.11a (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	14.0	13.0	14.5
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13.5	11.0	12.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13.5	9.5	11.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Average)			
Channel	Channel 38	Channel 46	--
Target (dBm)	11.0	12.0	--
Tolerance ±(dB)	1.0	1.0	--
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 38	Channel 46	--
Target (dBm)	11.0	12.0	--
Tolerance ±(dB)	1.0	1.0	--
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 42	--	--
Target (dBm)	11.5	--	--
Tolerance ±(dB)	1.0	--	--

UNII-1 Band – Antenna 2

IEEE 802.11a (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13.5	13.0	14.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13.0	10.5	11.5
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13.0	9.0	11.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Average)			
Channel	Channel 38	Channel 46	--
Target (dBm)	10.0	11.0	--
Tolerance ±(dB)	1.0	1.0	--
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 38	Channel 46	--
Target (dBm)	10.5	11.0	--
Tolerance ±(dB)	1.0	1.0	--
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 42	--	--
Target (dBm)	11.0	--	--
Tolerance ±(dB)	1.0	--	--

UNII-3 Band – Antenna 1

IEEE 802.11a (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	16.0	15.0	13.5
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	9.0	10.5	9.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	10.0	9.5	8.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Average)			
Channel	Channel 151	Channel 159	--
Target (dBm)	11.0	10.5	--
Tolerance ±(dB)	1.0	1.0	--
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 151	Channel 159	--
Target (dBm)	8.0	9.5	--
Tolerance ±(dB)	1.0	1.0	--
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 155	--	--
Target (dBm)	11.0	--	--
Tolerance ±(dB)	1.0	--	--

UNII-3 Band – Antenna 2

IEEE 802.11a (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	15.0	13.5	13.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	8.5	9.0	8.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	9.5	8.0	6.5
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Average)			
Channel	Channel 151	Channel 159	--
Target (dBm)	10.0	9.0	--
Tolerance ±(dB)	1.0	1.0	--
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 151	Channel 159	--
Target (dBm)	7.0	9.0	--
Tolerance ±(dB)	1.0	1.0	--
IEEE 802.11ac VHT80 (Average)			
Channel	Channel 155	--	--
Target (dBm)	8.5	--	--
Tolerance ±(dB)	1.0	--	--

8. Measurement Results

8.1 Standalone MPE

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 =20cm, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

WiFi 2.4GHz Band – Ant 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW					
IEEE 802.11b	17.0	50.1187	-1.89	0.6471	100%	0.0065	1.0000
IEEE 802.11g	17.0	50.1187	-1.89	0.6471	100%	0.0065	1.0000
IEEE 802.11n HT20	14.5	28.1838	-1.89	0.6471	100%	0.0036	1.0000
IEEE 802.11n HT40	15.0	31.6228	-1.89	0.6471	100%	0.0041	1.0000

WiFi 2.4GHz Band – Ant 2

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW					
IEEE 802.11b	13.0	19.9526	1.09	1.2853	100%	0.0051	1.0000
IEEE 802.11g	17.0	50.1187	1.09	1.2853	100%	0.0128	1.0000
IEEE 802.11n HT20	12.0	15.8489	1.09	1.2853	100%	0.0041	1.0000
IEEE 802.11n HT40	11.5	14.1254	1.09	1.2853	100%	0.0036	1.0000

UNII-1 Band – Ant 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW					
IEEE 802.11a	15.5	35.4813	0.78	1.1967	100%	0.0085	1.0000
IEEE 802.11n HT20	14.5	28.1838	0.78	1.1967	100%	0.0067	1.0000
IEEE 802.11ac VHT20	14.5	28.1838	0.78	1.1967	100%	0.0067	1.0000
IEEE 802.11n HT40	13.0	19.9526	0.78	1.1967	100%	0.0048	1.0000
IEEE 802.11ac VHT40	13.0	19.9526	0.78	1.1967	100%	0.0048	1.0000
IEEE 802.11ac VHT80	12.5	17.7828	0.78	1.1967	100%	0.0042	1.0000

UNII-1 Band – Ant 2

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW					
IEEE 802.11a	15.0	31.6228	0.66	1.1641	100%	0.0073	1.0000
IEEE 802.11n HT20	14.0	25.1189	0.66	1.1641	100%	0.0058	1.0000
IEEE 802.11ac VHT20	14.0	25.1189	0.66	1.1641	100%	0.0058	1.0000
IEEE 802.11n HT40	12.0	15.8489	0.66	1.1641	100%	0.0037	1.0000
IEEE 802.11ac VHT40	12.0	15.8489	0.66	1.1641	100%	0.0037	1.0000
IEEE 802.11ac VHT80	12.0	15.8489	0.66	1.1641	100%	0.0037	1.0000

UNII-3 Band – Ant 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW					
IEEE 802.11a	17.0	50.1187	0.02	1.0046	100%	0.0100	1.0000
IEEE 802.11n HT20	11.5	14.1254	0.02	1.0046	100%	0.0028	1.0000
IEEE 802.11ac VHT20	11.0	12.5893	0.02	1.0046	100%	0.0025	1.0000
IEEE 802.11n HT40	12.0	15.8489	0.02	1.0046	100%	0.0032	1.0000
IEEE 802.11ac VHT40	10.5	11.2202	0.02	1.0046	100%	0.0022	1.0000
IEEE 802.11ac VHT80	12.0	15.8489	0.02	1.0046	100%	0.0032	1.0000

UNII-3 Band – Ant 2

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW					
IEEE 802.11a	16.0	39.8107	-0.85	0.8222	100%	0.0065	1.0000
IEEE 802.11n HT20	10.0	10.0000	-0.85	0.8222	100%	0.0016	1.0000
IEEE 802.11ac VHT20	10.5	11.2202	-0.85	0.8222	100%	0.0018	1.0000
IEEE 802.11n HT40	11.0	12.5893	-0.85	0.8222	100%	0.0021	1.0000
IEEE 802.11ac VHT40	10.0	10.0000	-0.85	0.8222	100%	0.0016	1.0000
IEEE 802.11ac VHT80	9.5	8.9125	-0.85	0.8222	100%	0.0015	1.0000

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

8.2 Simultaneous Transmission MPE

Wi-Fi

Maximum MPE Ratio WIFI Ant.1	Maximum MPE Ratio WIFI Ant.1	∑MPE	Limit	Results
0.0100	0.0128	0.0228	1	PASS

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----------