

FCC Maximum Permissible Exposure (MPE) Estimation Report

Report Number : **68.910.24.0012.01-S1** Date of Issue: 2024-11-28

Model : **CM-36-E**

Product Type : CURTAIN MOTOR

Applicant : Coulisse B.V.

Address : Vonderweg 48, Enter, 7468 DC, Netherlands

Manufacturer : Coulisse B.V.

Address : Vonderweg 48, Enter, 7468 DC, Netherlands

Test Result : ☒ **Positive** ☐ **Negative**

Total pages including
Appendices

: **9**

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
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Guankou Erlu, Nantou, Nanshan District,
Shenzhen, Guangdong, China

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FCC Registration No.: 514049

FCC Designation Number: CN5009

3 Description of the Equipment Under Test

Product:	CURTAIN MOTOR
Model no.:	CM-36-E
FCC ID:	ZY4CM36E1
Options and accessories:	CM-36 CURTAIN BATTERY USB-C Manufacturer: Coulissee B.V. Input: USB-C 5V DC Ratings: 14.8VDC, 2600mAh
Ratings:	Input: DC 14.8V, 16W, 1A
RF Transmission Frequency:	433.925MHz; 2402MHz - 2480MHz for BLE 2405MHz - 2480MHz for Thread
No. of Operated Channel:	1 for 433.925MHz 40 for BLE (1Mbps&2Mbps) 16 for Thread
Modulation:	GFSK for 433.925MHz GFSK for BLE OQPSK for Thread
Antenna Type:	PCB antenna for 433.925MHz Line antenna for BLE/Thread
Antenna Gain:	2.2 dBi for BLE/Thread
Description of the EUT:	The EUT is a CURTAIN MOTOR with Bluetooth LE, Thread and 433.925MHz remote control functions.

NOTE 1: The above EUT's information is declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.



4 Test Specifications

Test Standards	
ANSI Std C95.1-1992	Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.(IEEE Std C95.1-1991)
KDB 447498 D01	General RF Exposure Guidance v06
CFR § 2.1091	Radiofrequency radiation exposure evaluation: mobile devices.



5 General Information

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Prepared By Project Engineer	2024-11-28	Myron Yu	 Signature
	Date	Name	
Approved By Project Manager	2024-11-28	Jessie He	 Signature
	Date	Name	

6 RF Exposure Requirements

An estimation of MPE in this application for product is used to ensure if it complies with the rules of the standard in the regulation list above.

Maximum permissible exposure (MPE) refers to the RF energy that is acceptable for human exposure. It is broken down into two categories, Occupational/controlled and General population/uncontrolled.

Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

A rough estimation of the expected exposure in power flux density on a given point can be made with the following equation:

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

Where:

S = power density

P = power input to the antenna

G = numeric gain of the antenna in the direction of interest relative to an isotropic radiator

R= distance to the centre of radiation of the antenna

EIRP = P*G

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user for keeping at least 20cm separation distance and the prohibition of operating to a person has been printed on the user's manual. Therefore, the S of the device is calculated with R=20cm, and if it is below the limit S, then we can conclude the device complies with the rules.

7 FCC MPE Limits

We analysis if it comply with the limits for General population/uncontrolled exposure. The FCC MPE limits for field strength and power density are given in 47CFR 1.1310(Table below). These limits are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP), and also partly based on guidelines recommended by the American National Standards Institute (ANSI) in Section 4.1 of ANSI/IEEE C95.1.

(A) Limits for Occupational/controlled Exposure				
Frequency Range(MHz)	Electric Field Strength(E)(V/m)	Magnetic Field Strength(H)(A/m)	Power Density (S)(mW/cm ²)	Averaging Time (minute) E ² , H ² or S
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
(B) Limits for General Population/uncontrolled Exposure				
Frequency Range(MHz)	Electric Field Strength(E)(V/m)	Magnetic Field Strength(H)(A/m)	Power Density (S)(mW/cm ²)	Averaging Time (minute) E ² , H ² or S
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	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	

8 RF Exposure Evaluation (FCC)

8.1 Calculation of Power Density for Single Chain Transmitters

Mode	EIRP (dBm)	EIRP (mW)	R (cm)	S (mW/cm ²)	Limit (mW/cm ²)	MPE Ratio (%)
BLE	-0.64	0.86	20	0.0002	1.0	0.02%
Thread	8.37	6.87	20	0.0014	1.0	0.14%

For 433.925MHz:

According to ANSI C63.10-2020 (Annex G.2 Field strength approach (linear terms)),

$$\text{EIRP} = p_t \times g_t = (E \times d)^2 / 30 \quad (\text{G.1})$$

where

- p_t is the transmitter output power in watts
- g_t is the numeric gain of the transmitting antenna (dimensionless)
- E is the electric field strength in V/m
- d is the measurement distance in meters (m)

$$\text{ERP} = \text{EIRP} / 1.64 = (E \times d)^2 / (30 \times 1.64) = (E \times d)^2 / 49.2 \quad (\text{G.2})$$

where all terms are as previously defined.

Mode	Field Strength $E_{\text{Meas}} @ 3\text{m}$	ERP (mW)	R (cm)	S (mW/cm ²)	Limit (mW/cm ²)	MPE Ratio (%)
433.925MHz	77.26(dBuV/m)	0.00973	20	0.0000019	0.2893	0.0007%

8.2 Calculation of Simultaneous Transmission

In order to ensure compliance with the EMF for a controlled environment, the sum of the ratios of the power density to the corresponding EMF should not exceed unity. That is

$$\sum_i \frac{S_i}{S_{\text{Limit},i}} \leq 1$$

The product also has multiple transmitters. The simultaneous transmission possibilities are as below:

No.	Simultaneous Tx Combination	MPE Ratio	Limit
1	BLE + 433.925MHz	0.0207%	1.0
2	Thread + 433.925MHz	0.1407%	1.0

8.3 Conclusion

According to the table above, we can conclude that the limit percentage of above supporting frequency bands calculation results are less than 1, therefore, the product meets the requirements.