5KW HIGH ENERGY LASER DEFENSE SYSTEM

TECHNICAL SPECIFICATIONS

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1、 System Overview

The 5KW directional high-energy laser defense system, comprehensively utilizes high-energy laser, electronic information, image processing and other technologies to realize intelligent identification and high-precision tracking of far-field UAV targets, balloons, birds, kites and other small targets. Aiming, laser damage, to achieve rapid disposal of the target. The system can be deployed on a vehicle, in a container, or fixedly installed on top of a building.

2、 System Functions and Components

2.1、System Functions

The main functions of the whole system are as follows:

（1） It can access radar and other target guidance information, and can locate and image targets according to the guidance information

（2） It can quickly and intelligently identify UAV targets, and further realize automatic and intelligent tracking of UAV targets

（3） With high-energy laser beam convergence and control capabilities, it can achieve rapid physical damage to UAV targets.

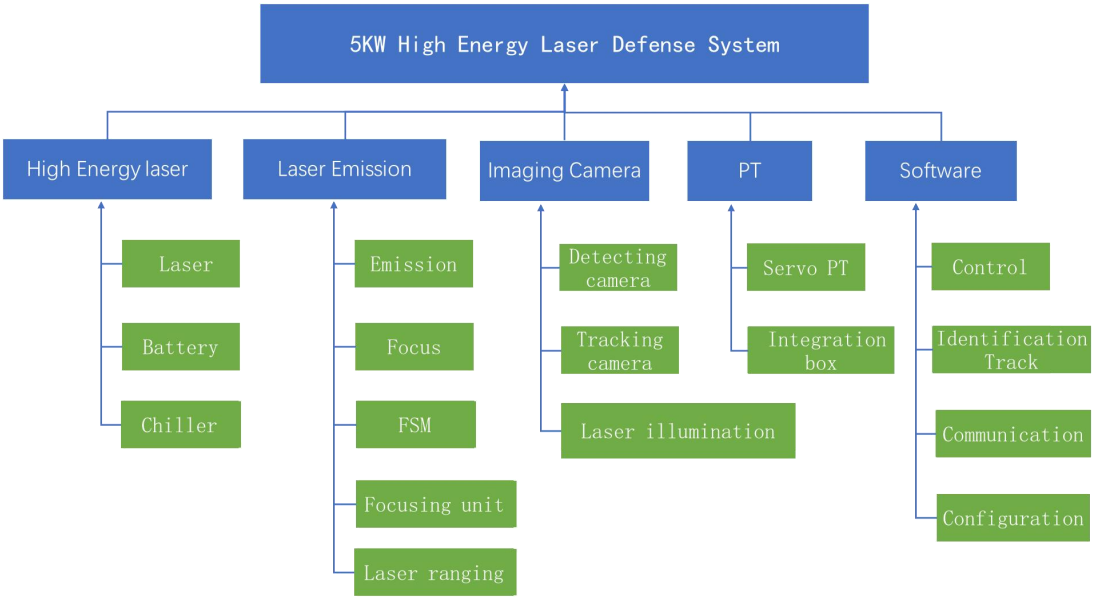
（4） Ability to work at night

（5） Provide a convenient operation interface, which can coordinate the effective work of each system, control the system to emit light, stop light, record, etc., and monitor the working status of each part of the system

（6） The system can be easily disassembled, transported, assembled and debugged, and can also be easily integrated in vehicles。

3、 2.2、System Components

According to the functional division of the damage system, the design system is composed of six major parts: high-energy laser subsystem, laser emission optical path, laser illumination, imaging, servo, and intelligent software control. The composition of each functional part is shown in the figure below:



Picture 1　5KW high energy laser defense system

（1）High Energy Laser

It provides a high-energy laser light source for the damage system, and its main components include a laser, a power supply battery, and a water cooler. Among them, the power supply battery and water cooler are customized according to the working hours of the laser and water cooling requirements.

(2) Laser emission

The laser emitting optical path realizes the beam control of the high-energy laser beam. The function realization includes laser collimation system, laser focusing system and fine pointing control. The hardware consists of beam expanding optical path (lens), focusing optical path (lens), fast mirror, adjustment The focal unit consists of 4 parts.

(3) Laser Illuminator

In order to realize the system to work at night or when the light is dark, the system uses laser lighting to supplement the light for the system. The laser lighting subsystem consists of two parts: the lighting load box and the lighting laser..

(4) Imaging

The imaging system mainly includes perception imaging system and tracking imaging system.

(5) PT Servo

The servo is mainly composed of a servo turntable and a main integrated load box, in which the main integrated load box realizes the integrated hardware integration of laser emission optical path, laser ranging and other hardware, which facilitates the integrated rigid motion work of the entire hardware part.

(6) Intelligent software control

Intelligent software control is the control center of the whole system. One is to realize the signal control and cooperative work of lasers, distance measuring machines, lighting lasers, imaging, servo turntables, etc. through serial ports, network ports, and high-speed data link ports. On the one hand, it realizes the intelligent identification and tracking of targets, and realizes the closed-loop strike link. At the same time, it also provides external communication (remote control, receiving external target guidance information, external feedback on strike effects, etc.), strike recording, system status monitoring, system configuration and other functions.

No.	Item	Parameter	Remark
1.	Laser Power	≥5KW	
2.	Working Distance	≥1200m	Taking the DJI UAV as a typical target, it can capture and track the target from 1200m, strike from 1100m, and effectively destroy the target at 900m.
3.	Damage distance	≥900m	
4.	Damage time	≤15s	From the beginning of the light to the target falling
5.	Target intelligent detection	Detection rate≥95%	Support the detection and identification of typical UAV targets
6.	Track accuracy	≤15 μrad （RMS）	
7.	Continuous light time	≥120s	
8.	Power consumption	≤25KW	
9.	Power supply	AC 380V/50HZ	
10.	Working temp.		

		0℃～+40℃	
11.	Storage temp.	-30℃～+60℃	
12.	Wind resistance	Max eighth-level wind	works normally under the fifth-level wind, and it will not be damaged under the Max eighth-level wind
13.	MTBF	≥720h	
14.	MTTR	≤2h	

3.1、Key Components Specifications

According to the functional requirements of the system, the core technical indicators of each system are designed as shown in the table below

3.2、Key Components Specifications

In order to achieve the overall combat technical indicators of the system, the technical indicators for each key component are designed as follows

3.2.1、High Energy Laser Specifications

No.	Item	Parameter	Remark
1.	Power	≥5KW	
2.	Beam M^2	≤1.6	
3.	Center wavelength	1080nm	
4.	output fiber core diameter	25 μm	
5.	output fiber core length	4m	
6.	Power supply	DC 200V	Battery power
7.	Laser photoelectric conversion efficiency	≥30%	
8.	Power consumption	≤16KW	
9.	Control interface	RS422	
10.	Cooling capacity of water cooler	≥10KW	Customized according to the Laser power
11.	Water cooler water flow	≤45L/min	

3.2.2、Laser Emission Specifications

No.	Item	Parameter	Remark
1	Launch caliber	160mm	
2	Lens transmittance	≥99%	
3	Lens tolerance	5kw continuous light output for 15 minutes without damage	
4	FS Mirror type	Voice coil motor	
5	FS Mirror reverse	±1°	
6	FS Mirror caliber	50mm	
7	FS Mirror resolution	$\leq 1\ \mu rad$	
8	FS Mirror repetition accuracy	$\leq 2\ \mu rad$	
9	Resonance frequency	≥450HZ	
10	Closed loop bandwidth	≥200HZ	
11	Communication interface	RS422	

3.2.3、Laser Illuminator Specifications

No.	Item	Parameter	Remark
1	Working mechanism	Continuous light	
2	Wave length	808nm	
3	Power consumption	40W	
4	Laser Angle	0.3°～19°	
5	Laser Lens	60Xf1.2～80mm	
6	Night vision distance	1500m	
7	Communication interface	RS422	

3.2.5、Imaging Camera Specifications

Detection camera

No.	Item	Parameter	Remark
1	Detect distance	≥1500m	
2	Resolution	1920(H)×1080(V)	
3	CMOS	1/1.8"	
4	Pixel size	3.75μm×3.75μm	
5	Frame rate	60fps@1920×1080	
6	Interface	SDI	
7	Power	12V±10%	
8	Wavelength	400-900nm	
9	Focal length	12.5-775mm	
10	Max track FOV	33°×18.5°	
11	Min track FOV	0.53°×0.3°	

Track Camera

No.	Item	Parameter	Remark
1	Track distance	≥1200m	
2	Resolution	1920(H)×1080(V)	
3	CMOS	1/2"	
4	Pixel size	3.45μm×3.45μm	
5	Frame rate	60fps@1920×1080	
6	Interface	SDI	
7	Power supply	9-24V	
8	Power consumption	3.25W@12VDC	
9	B/W/ Color	Color	
10	Wave length	Day：400-680nm Night：808±20nm	

11	Focus	650mm	
12	FOV	0.58°×0.33°	
13	Lens control	Auto/Manual	
14	Interface	RS422	

3.2.6、PT Servo Platform Specifications

No.	Item	Parameter	Remark
1	Azimuth	-185°～185°	
2	Pitch	-10°～60°	
3	Min. Speed	0.01°/s	
4	Max. Speed	60°/s	
5	Max. acceleration	60°/s2	
6	Accuracy tracking speed	≥20°/s	
7	Precise tracking speed	≥10°/s²	
8	Closed loop delay	≤10ms	

3.2.7、Intelligent Software Specifications

No.	Item	Parameter	Remark
1	Average response time	≤5ms	Including lasers, illumination lasers, various imaging cameras, servo turntable control, etc
2	Target overall trace bandwidth	≥60HZ	
3	Intelligent target detection	Detection≥95%；	
4	Coarse tracking accuracy	≤0.3mrad（3σ）	
5	Fine tracking accuracy	≤15μrad（RMS）	
6	Other functions	Receive target guidance	

		information; feedback target position; feedback strike effect; video recording; remote control; system monitoring; system configuration	

3.2.8、Laser Range Finder Specifications

No.	Item	Parameter	Remark
1.	Wavelength	1535nm	
2.	Distance	≥1.2km	
3.	Accuracy	≤2m	
4.	Ranging Frequency	1-10Hz	
5.	Angle	≤0.4mrad	
6.	Interface	RS422	