

# Fixed Laser Hard Kill Device

## 1. Device Overview

The fixed laser hard kill device is mainly designed for small UAV targets. It achieves physical interception of threatening targets within the protected airspace, interferes with their carried optoelectronic sensors, and prevents small UAVs from conducting close-range reconnaissance and "suicide" attacks. Adopting a portable and modular design concept, it can be quickly moved, deployed, and erected for use. It can also be used in a fixed manner for a long time. With an optional gyroscope, it can be used on-board while the vehicle is moving.

The fixed laser hard kill device consists of a tracking and aiming system, a high-energy laser system, and a display and control system. The tracking and aiming system mainly includes a high-energy laser emission system, a long-focus precision tracking camera, an infrared camera, laser ranging, laser illumination and other sensors. Integrated with a servo system, signal processing, and power supply system, it realizes target acquisition, tracking, and aiming, while completing the focused emission of laser beams. The high-energy laser system is composed of a fiber laser, a thermal management module, and an energy storage battery, connected to the tracking and aiming system through a power fiber. The display and control system includes a display and control tablet computer and display control software.

## 2. Functional Features

1. Capable of target acquisition, tracking, and aiming;
2. Capable of interfering with target optoelectronic payloads;
3. Capable of damaging target airframes;
4. Equipped with automatic and semi-automatic working modes, supporting remote control;
5. Capable of working in complex environments;
6. Modular design, meeting the requirements of on-board and mobile use.

## 3. Main Performance Specifications

System Specifications	Sub-items	Details
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Interference Distance		$\geq 2\text{km}$ (Atmospheric visibility 10km, moderate atmospheric turbulence, humidity $\leq 60\%$ )
Maximum Damage Distance		0.5-1km (DJI Phantom 4 , Atmospheric visibility 10 km, moderate atmospheric turbulence, humidity $\leq 60\%$ )
Interception Time		$\leq 10\text{s}$
Cumulative Laser Emission Time		$\geq 300\text{s}$
<b>Tracking and Aiming System</b>	Effective Emission Aperture	$\geq 160\text{mm}$
	Spot Size at 1km	$\leq 28\text{mm}$
	Tracking and Aiming Accuracy	$\leq 10\mu\text{rad}$
	Fast Steering Mirror Stroke	$\geq \pm 0.4^\circ$
	Fast Steering Mirror Closed-Loop Bandwidth	$\geq 300\text{Hz}$
<b>Fiber Laser</b>	Output Power	$\geq 6000\text{W}$ (3000W $\times 2$ )
	Beam Quality $M^2$	$\leq 1.3$
	Central Wavelength	1060nm/1090nm
	Collimated Output Spot Diameter	10.5~12.5mm
	NA Value	-
<b>Precision Tracking Camera</b>	Lens Focal Length	1040mm
	Aperture	F6
	Field of View	$0.2^\circ \times 0.2^\circ$

	Imaging Band	400~900nm
	Pixel Size	3.45 $\mu$ m
	Resolution	1024(H) $\times$ 1024(V)
	Frame Rate	$\geq$ 200Hz
<b>Coarse Tracking Infrared Thermal Imager</b>	Detector Type	Cooled Mid-Wave Infrared
	Pixel Size	12 $\mu$ m
	Effective Pixels	640 $\times$ 512
	Spectral Range	3~5 $\mu$ m
	Temperature Sensitivity	$\leq$ 30mK
	Focal Length	30~300mm
	Field of View	18.3 $^{\circ}$ $\times$ 14.6 $^{\circ}$ ~ 2.1 $^{\circ}$ $\times$ 1.7 $^{\circ}$
	Spatial Resolution	mrad
	Focusing Mode	Electric Focus
	Zoom	Optical Zoom 8 $\times$
	Pseudo Color	White Hot / Black Hot
	Image Processing	Non-Uniformity Correction / Digital Filtering Denoising / Digital Detail Enhancement
<b>Laser Ranging</b>	Laser Wavelength	1.5 $\mu$ m
	Light Source Type	Semiconductor Pumped
	Ranging Capability	$\geq$ 1500m (DJI Phantom 4)
	Ranging Accuracy	$\pm$ 2m
	Operating Frequency	1Hz/5Hz
	Accuracy Rate	98%

## Laser Illumination

Wavelength	808nm	
	Output Power	100W
	Illumination Angle	5mrad
	Illuminator Control	Automatic / Manual Control
	Effective Illumination Distance	$\geq 1000\text{m}$
<b>Servo Turntable</b>	Platform Type	2-Axis
	Stability Accuracy	$\leq 50\mu\text{rad (RMS)}$
	Azimuth	$\pm 90^\circ$
	Elevation	$-30^\circ \sim +80^\circ$
	Azimuth Angular Acceleration	$\geq 100^\circ/\text{s}^2$
	Elevation Angular Acceleration	$\geq 100^\circ/\text{s}^2$
	Azimuth Angular Velocity	$\geq 100^\circ/\text{s}$
	Elevation Angular Velocity	$\geq 100^\circ/\text{s}$
	Repeat Positioning Accuracy	$\pm 0.01^\circ$
	Communication Interface of Tracking and Aiming System	RS422/RS485/GbE
<b>General Specifications</b>	Power Interface of Tracking and Aiming System	DC28V
	Total Power Consumption of Tracking and Aiming System	$\leq 1500\text{W}$
	Protection Level of Tracking and Aiming System	IP66
	Operating Temperature of Tracking and Aiming System	$-40^\circ\text{C} \sim +50^\circ\text{C}$

Storage Temperature of Tracking and Aiming System	-50°C ~ +65°C	
	Weight of Tracking and Aiming System	≤100kg
	Dimensions of Tracking and Aiming System	≤540mm × 480mm × 650mm
	Operating Temperature of Laser	-20°C ~ +45°C
	Storage Temperature of Laser	-40°C ~ +65°C
	Laser Power Supply	DC200V ~ 220V (Battery Powered)
	Laser Power Consumption	20kW
	Laser Weight	≤80kg
	Laser Dimensions	-
	Battery Weight	≤40kg
	Battery Dimensions	-
	MTBF (Mean Time Between Failures)	≥1000h
	MTTR (Mean Time To Repair)	≤0.5h