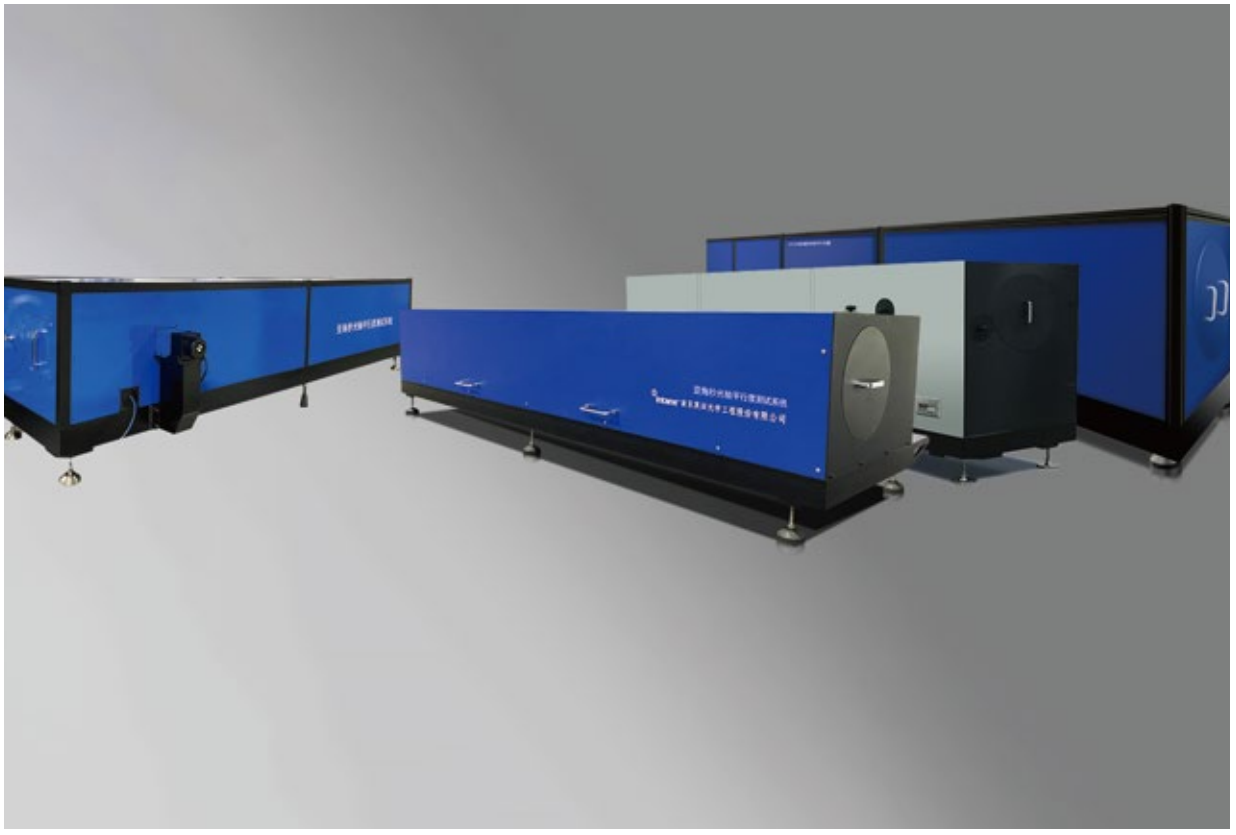
Intane OPTICS 英田光学

Collimators



Company profile

Nanjing Intane Optics was founded in 2003 by Professor Zhou Bifang, the former director of Nanjing Astronomical Instruments Research Center, the Chinese Academy of Sciences. Nanjing Intane Optics is a national high-tech enterprise with precision optical systems solutions at its core competency. The company boasts a team of experienced engineers in precision optical engineering, with proven technological capabilities ranging from complex system design, integration, assembly, testing to the manufacturing of key optical components.

Advanced optical elements are the core components that determine the performance of precision optical instruments. As technology and requirements develop, there are increasingly higher demands for the performance of advanced optical elements.

Nanjing Intane Optics is actively engaged in research on ultra-precision optical component processing technology. With internationally advanced polishing and testing equipment, combined with self-developed CNC equipment, our experienced technicians team is constantly taking on challenges of high-performance optical component manufacturing with increasing difficulty. We have achieved full-spectrum nano-scale processing accuracy in the manufacturing of optical aspherics, spheres, planes, cylinders, and windows. Through high-performance optical coating, our products feature long life, high reliability, high strength, and diversity of optical components.

Based on high-precision optical components, Intane Optics also has developed a series of high-precision optical testing instruments and equipment. Collimators of various aperture and specifications have a good reputation among customers. Intane Opics: Your trusted supplier for precision optical system solutions.

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ONE WORLD CONNECT
WITH LASER

Reflective collimator

The systems are not limited by dimensions and transmittance of optical material blanks (such as refractive index, uniformity, stripes and extent of bubble). Usually, they are made of fused quartz, glass ceramics or, for special applications, aluminum, SiC, etc.

The systems are not limited by the operating frequency or have chromatic aberration and apply to ultraviolet light to long-wave infrared light. They usually use aspheric parts and can realize precision systems with large apertures (up to 1.5m) and long focal lengths (from tens of meter to more than one hundred meters). The system precision can be up to rms and better than λ/25@632.8nm.

The optical paths can be Newtonian, Cassegrain, RC reflection, multiple reflections or spherical reflection, depending on the field, the precision and the size; the systems can be co-axial or off-axis ones, depending on the shielding need.

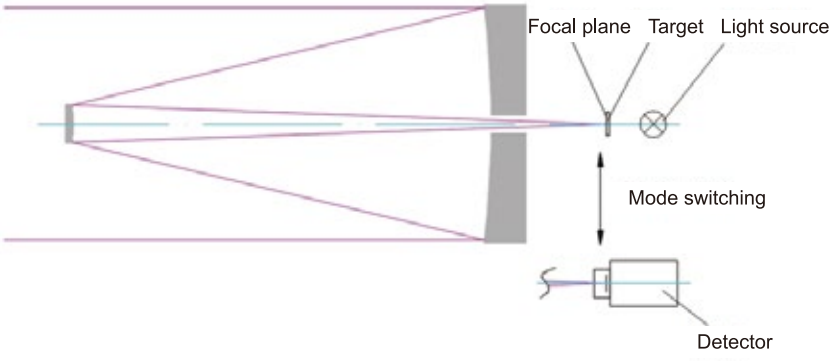
Metal film (such as aluminum film, silver film or gold film) or dielectric film can be chosen according to the transmittance and the laser loss threshold (up to 100W/cm2 for metal film, or up to 30KW/cm2 for dielectric film).

The systems can have lightweight design.

Parameters:

Structure	Newtonian, Cassegrain, or RC reflection
Clear aperture	50 mm ~ 1500mm
Operating wave band	Reflective, from ultraviolet light to infrared light
Focal length	F3 ~ F10
Precision	RMS ≤1/25in@632.8nm (depending on the optical parameters and the form)

* Special parameters are customizable.



Schematic Diagram of Reflective Collimator

100mm off-axis reflective collimator

Parameters:

Effective aperture	φ100mm	Effective focal length	1.5m
Spectral region	400nm ~ 2500nm	Beam parallelism	<2.5″
Optical quality	On-axis wave aberration RMS ≤λ/20 (λ= 632.8nm)	Weight	<200kg
Regulator	Fine adjustment with multi-degree of freedom		

200mm coaxial collimator

Parameters:

Focal length	1600mm ± 0.5%
Effective aperture	φ200mm
Surface precision	RMS superior to λ/10 (λ= 632.8nm)
Material	SCHOTT ZERODUR®

200mm off-axis three-mirror collimator

Parameters:

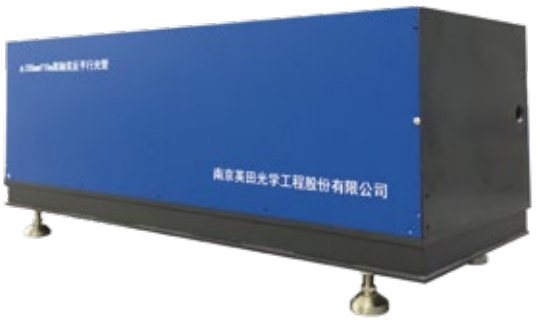
Clear aperture	φ200mm	Focal length	1000mm
Relative aperture D	1/7.5	Field	1°, far field
Precision	In full field, λ/15 RMS, λ= 632.8nm		
Structure	Unshielded off-axis three-mirror structure		
Overall dimensions	1100mm x 700mm x 500mm		

200mm sub-arcsecond parallelism test system

Parameters:

Focal length	2150mm/215mm	2150mm/215mm
Effective aperture	φ200mm	φ200mm
Surface precision	RMS superior to λ/14 (λ= 632.8nm)	RMS superior to λ/14 (λ= 632.8nm)
Operating wavelength	400 nm ~ 900nm	400 nm ~ 900nm
Center field full aperture surface accuracy	RMS ≤λ/14 (λ= 632.8nm)	RMS ≤λ/14 (λ= 632.8nm)
Operating conditions	Room temperature	Emergent beam parallelism superior to 1″
Optical test system with axis conformity accuracy : 0.5″(based on CCD camera resolution application)		

200mm off-axis bimirror collimator



Parameters:

Type	Off-axis Newtonian reflection type
Wave aberration	Center field superior to λ/15 (λ= 632.8nm)
Working wavelength	0.5 ~ 0.95um, 1.45 ~ 1.6um
Clear aperture	200mm
Focal length	10m

220mm off-axis Newtonian reflection collimator

Parameters:

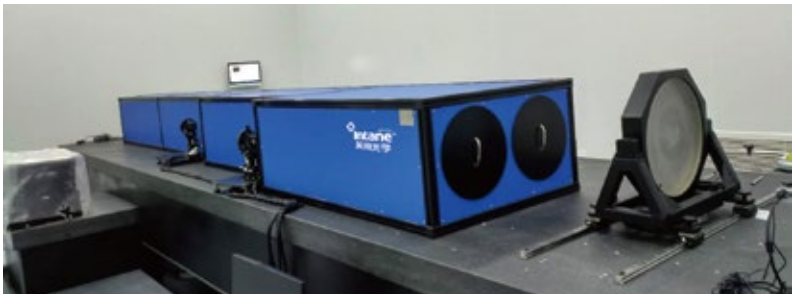
Clear aperture	φ220mm	Operating wave band	0.35um ~ 2um
Field	1.3°	Precision	PV superior to λ/2 (@632.8nm)
External dimensions	≤1100 x 750mm x 500mm	Mechanical material	Invar
Height adjustment range	±5mm	Operating temperature	0° ~ 40°
Vibration resistance	Random vibration	Sinusoidal vibration 5Hz ~ 55Hz	Peak: 0.33mm

250mm coaxial Newtonian reflection collimator

Parameters:

Clear aperture	φ250mm
Primary and secondary mirror material	ZERODUR®
System precision	1/10λRMS, λ= 632.8nm
Focal length	1500mm
Material of window protection glass	Fused quartz
Operating wavelength	355nm, 532nm, 1064nm

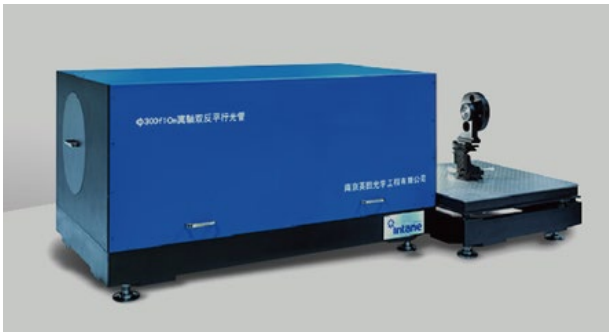
300mm bifocal off-axis reflective collimator



Parameters:

Technical index	Acceptance value
Effective clear aperture	≥300mm
Reflection coatings	Silver coating + protective film: reflectivity: >95%; wavelength: 632.8nm, 800nm, 1550nm
Focal length of off-axis system	18m/6m
Wave aberration of long-focus system	RMS ≤0.04λ, λ= 632.8nm
Center height of optical axis	270 ± 10mm

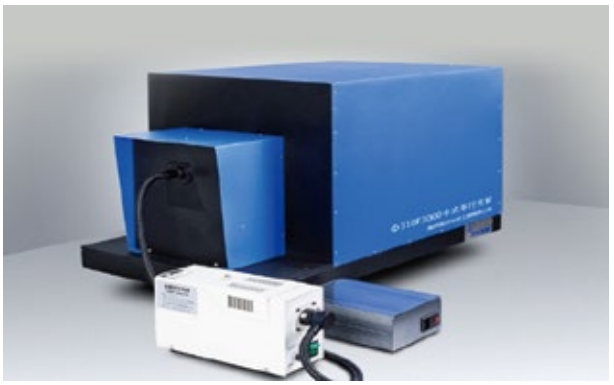
300mm off-axis Cassegrain reflection collimator



Parameters:

Clear aperture	φ310mm
Field	2ω= 0.5°
Focal length	3000mm
Operating wavelength	450nm ~ 2500nm
Precision	0 ° field: RMS superior to λ/20; 0.5° field, RMS superior to λ/10; 1° field, RMS superior to λ/2 (λ = 632.8nm)

310mm off-axis Cassegrain reflection collimator



Parameters:

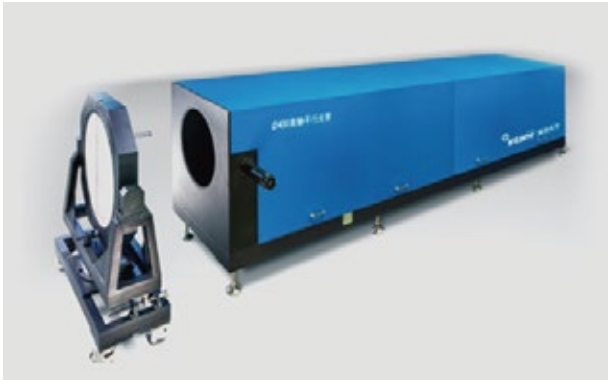
Clear aperture	φ310mm
Field	2ω= 0.5°
Precision	0° field: RMS superior to λ/20; 0.5° field, RMS superior to λ/10; 1° field, RMS superior to λ/2 (λ = 632.8nm)
Focal length	3000mm
Operating wave band	450nm ~ 2500nm

330mm off-axis reflective collimator

Parameters:

Clear aperture	φ330mm
Operating spectral coverage	Reflective part: 300nm ~ 1100nm; transmission part: 400nm ~ 900nm
Transmittance variation	Tpv ≤11.5%
Emergent parallelism	Superior to 0.836″ (Φ ≤150mm)
Focal length	3000mm
Wave aberration	RMS <λ/20 (λ=632.8nm)
Thermal stability of the optical axis	Superior to 0.89″/℃ (20℃ ± 5℃)

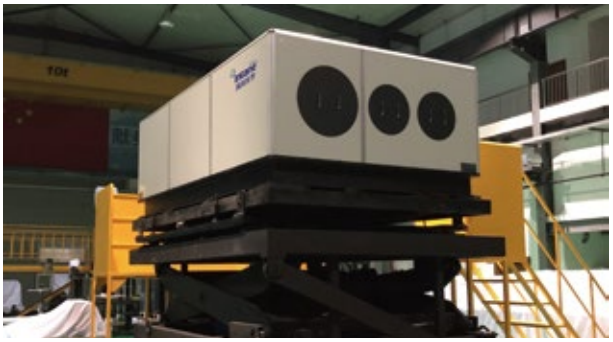
400mm off-axis Newtonian reflection collimator



Parameters:

Clear aperture	φ400mm
Precision	Superior to λ/20 (RMS), λ = 632.8nm
Focal length	4000mm
Operating wavelength	0.4 ~ 2μm

500mm off-axis collimator



Parameters:

Aperture	500mm
Focal length	3000mm
Wavefront mass of parallel emergent beam	Superior to λ/3PV@633nm
Wave band of light source	Visible light, near-infrared light, medium-wave infrared light, long-wave infrared light

800mm coaxial collimator

Parameters:

Clear aperture	φ800mm
Field	35mm
Operating wavelength	0.4 ~ 20μm
Focal length	15000mm
Precision	Superior to λ/20 RMS (λ = 632.8nm)

1200mm off-axis collimator

Parameters:

Structure	Off-axis Newtonian	Effective aperture	φ1200mm
Focal length	8000mm	Effective field	45´
Reflectivity	>0.96, 3 ~ 12um	Precision	RMS ≤0.1λ (λ = 632.8nm)

Applications:

1. The testing, calibration and simulated testing of aerospace equipment including high-precision spaceborne equipment and optical elements such as satellite cameras, space telescopes, spacecrafts' optical sealed windows;
2. The testing and calibration of airborne optical equipment;
3. The testing and calibration of civil high-precision optical equipment and parts

1500mm coaxial Cassegrain reflection collimator

Parameters:

Clear aperture	φ1500mm	Focal length	52m (±2%)
Field	≥6´	Wave band	0.4μm~5μm
Center height	3000mm	suface accuracy (RMS) of the primary mirror	λ/40@632.8nm (uncoated compensator testing)
RMS wave aberration	Superior to 120nm (full field)	Structure	Coaxial Cassegrain
Location of focal plane	Nasmyth focus	Environmental adaptability	Focal plane moving ≤±0.6mm (22±5℃)

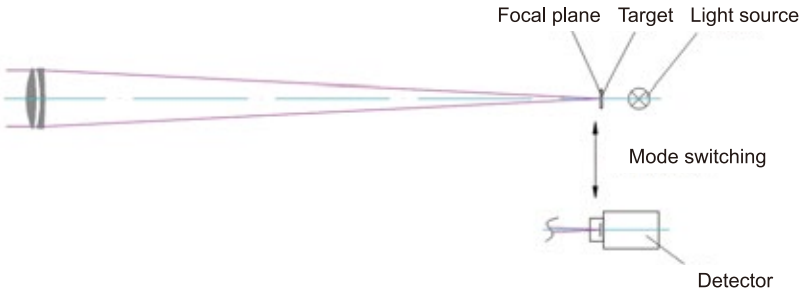
Refractive collimator

1. The systems usually have spherical transmission parts, simple structures, easy carrying, and high precision for ordinary optical testing and calibration;
2. Limited by dimensions and transmission of their materials, the systems are not applicable to large-aperture, full-wave-band objects but mainly applicable to visible light;
3. At the narrow wave band, the systems can achieve larger fields.

Parameters:

Parameter	Value
Structure	Transmissive
Clear aperture	≤150mm
Operating wavelength	Usually 400nm ~ 800nm near-infrared single wavelength
Focal length	F1 ~ F10
Precision	RMS ≤λ/10 (depending on the optical parameters and form)

* Special parameters are customizabl.



Schematic Diagram of Refractive Collimator

80mm refractive collimator

Parameters:

Operating wavelength	905nm, 1550nm	Focal length	80mm
Clear aperture	φ50mm	Field	>0.5°
Angular resolution	<0.1mrad	Far-field spot position precision	<0.1mm

Beam quality measuring device

The beam quality measuring device is a 130mm refractive collimator characterized by multiple wave bands, achromatism, athermalization and vibration resistance. It can realize high-precision measurements for the quality of far-field laser beams.

Parameters:

Effective aperture	Φ130mm
Expanding/converging times of beam expander	12X
Operating wavelength	1020nm ~ 1095nm, 532nm, 633nm
Image quality	PV <1/4λ (λ@632.8nm)
Operating temperature	-10℃ ~ 40℃
Focusing lens	320mm

50mm refractive collimator

Parameters:

Operating wavelength	1550nm
Clear aperture	Φ50mm
Angular resolution	<0.1mrad
Focal length	140mm
Field	>0.5°
Far-field spot position precision	<0.1mm

140mm refractive collimator

Parameters:

Focal length	1000mm
Precision	1/10 ~ 1/15 wave RMS (@632.8nm)
Aperture	Φ140mm

Large-field collimator

Parameters:

Focal length	500±10mm	Operating wavelength	900 ~ 910nm
Entrance pupil size	>40mm	Entrance pupil position	Distance from the first lens > 100mm
Field	>±16°	Far-field spot position precision	<50um
Angular resolution	Center: ± 6°, field <0.01°, fringe field of view <0.02°		
System distortion	Optical system <3%	Stray light of system	PSRR <10-5
Lens coating	Anti-reflection by 99.5%	Optical structural member	Blackening or delustering is needed
Frosted glass	300 * 100 close to Lambertian scattering	Star tester	50 um -Φ25-H-K9L
Cross reticle	16*16 -Φ25-H-K9L	Porro board	Φ25-H-K9L
Resolving power test target	USAF-76.2*76.2-H-K9L	External dimensions	≤1.5*Φ200mm
Operating conditions	Temperature: 20℃ ~ 30℃; relative humidity: 30%~90% (Applicable to ordinary workshops)		

50mm transmissive collimator

Parameters:

Operating wavelength	905nm, 1550nm
Clear aperture	Φ50mm
Angular resolution	<0.1mrad
Focal length	1000mm
Field	>0.5°
Far-field spot position precision	<0.1mm

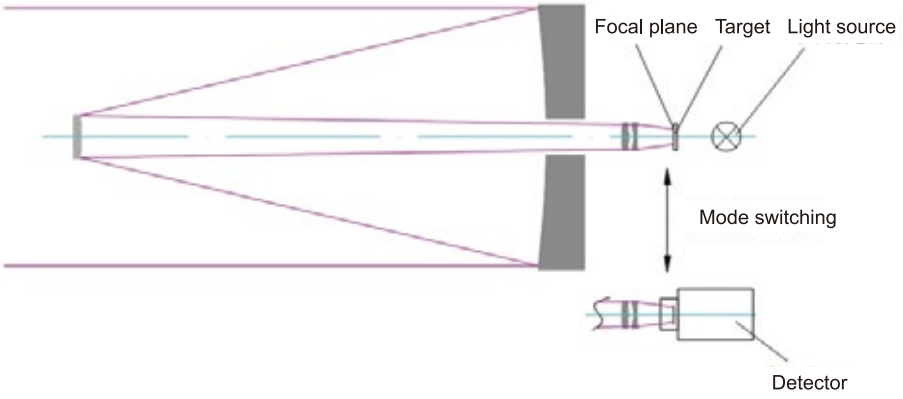
Catadioptric collimators

A catadioptric collimator is actually a reflective collimator with an additional transmission element. With some additional advantages of reflective collimators, catadioptric collimators can realize large-aperture, long-focus, large-field, high-precision optical systems.

Parameters:

Parameter	Value
Structure	Catadioptric
Clear aperture	Φ50mm ~ 1500mm
Operating wavelength	Usually, the visible light wave band or the near-infrared single wavelength
Focal length	F3 ~ F10
Precision	RMS ≤λ/15 (depending on the optical parameters and form)

* Special parameters are customizabl.



Schematic Diagram of Catadioptric Collimator

400mm catadioptric collimator

Parameters:

Clear aperture	φ400mm
Focal length	2130mm
Field	≥40.2°
Focusing resolution	≤5μm
Focusing range	≥4mm
Wave aberration	RMS ≤0.075λ (λ@632.8nm)

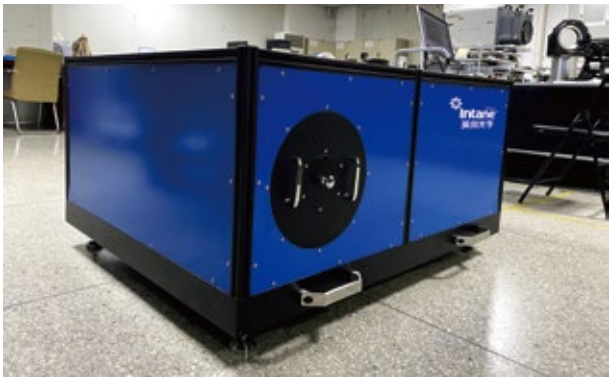
90mm catadioptric collimator

It is an anti-interference performance test system

Parameters:

Clear aperture	90mm
Emergent beam parallelism	≤1′
Operating wavelength	3um ~ 5um

Off-axis beam expander



It is built in with a 15X beam expanding antenna, a beacon signal receiving and transmitting path, a power detector, an interference simulation module, etc. It integrates optical, mechanical and electrical elements well and is a one-stop test workstation. It can detect the system parameters of remote optical communication devices and simulate the remote optical communication between device A and device B.

Parameters:

Antenna type	Off-axis beam expansion
Clear aperture	250mm
Operating wavelength	0.5 ~ 0.85μm, 1.05 ~ 1.7μm

Dynamic test simulation system

A coaxial catadioptric collimator essentially consists of an optical system, a mechanical housing, a cross target, a uniform light source, a cross target fine adjustment mechanism, a light pipe fine adjustment mechanism and a laser indicator and has a clear aperture of 350mm and a focal length of 3034mm. It is used for generating simulated targets at infinity.

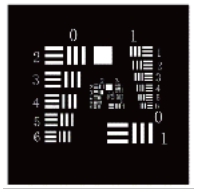
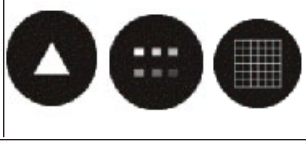
Internal channel far-field spot measurement system

The system is made up of a beam expander and a measuring optical path. It is mainly used for setting far-field beam quality measurement. It covers the mid-infrared wave band and the infrared wave band and applies to out-field measurement.

Parameters:

Clear aperture	Φ450mm
Main beam expander wavefront aberration	pv <λ/3, RMS <λ/15 (λ = 632.8nm)
Mid-infrared focus lens combination	3μm ~ 5μm achromatism, pv <λ/4 (λ = 632.8nm)
Near-infrared focus lens combination	0.9μm ~ 1.7μm achromatism, pv <λ/4 (λ = 632.8nm)

Collimator accessories

Category of accessory	Appearance	Accessory	Specification	Material	Application
Target		Star tester	5μm ~ +	Optical glass (usually fused quartz or K9L) or another metallic material (usually stainless steel), depending on the wave band used	The target is usually put on the focal plane of the collimator. It can be used with the light source or the detector to realize optical axis alignment or aiming (e.g., a cross reticle), lens focal length measurement (through a Porro board), lens resolution measurement (through a star tester, a resolving power test target and so on), MTF testing (knife-edge target), MRTD testing (a four-bar target or a triangular target), NETD (a square target), etc. The size, the line width and the line pair chosen depend on parameter of the tested component and the system.
		Cross reticle	Determine according to conditions on the site.		
		Porro board	Choose the line pair according to the need.		
		Resolving power test target	A1-A7	Usually fused quartz or K9, or an infrared material, depending on the wave band used	
		USAF1951 target plate	-2~7 group	Optical glass (usually fused quartz or K9) or another metallic material (usually stainless steel), depending on the wave band used (the latter choice is difficult to realize when the resolution is high)	
		Four-bar target	Choose the line width and the line pair according to the resolution requirement.	Optical glass (usually fused quartz or K9) or another metallic material (usually stainless steel), depending on the wave band used (the latter choice is difficult to realize when the resolution is high)	
		Semi-circle target	Optical glass	Optical glass (usually fused quartz or K10) or another metallic material (usually stainless steel), depending on the wave band used (the latter choice is difficult to realize when the resolution is high)	
		Other	There are many other targets such as triangular targets, gray scale target, profile target, square target or distortion target. Choose according to the application.		

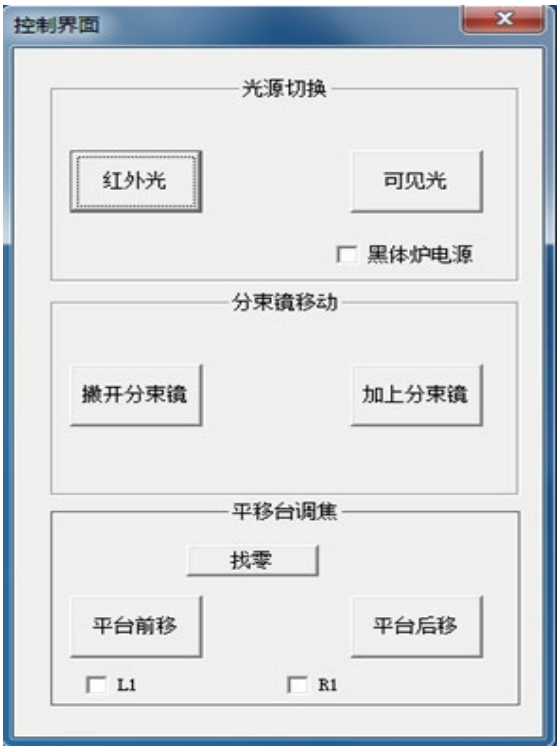
Category of accessory	Accessory	Corresponding wave band	Application
Light source	Deuterium lamp	Ultraviolet light	After being put on the focal plane of the collimator, the light source can be used with proper targets to generate different types of targets at infinity. The targets at infinity will be received by other tested elements (for the application, refer to the "Application described in description of the target" column in the table about targets above). The light source chosen depends on the operating wavelength.
	Xenon lamp	Ultraviolet light + visible light	
	LED lamp	Single-color light or white visible light	
	Halogen lamp	Visible light + near-infrared light	
	High-temperature blackbody furnace	Near-infrared light	
	Medium-temperature blackbody furnace	Mid-infrared light	
	Low-temperature blackbody furnace	Far-infrared light	
	Fiber laser	Visible light ~ infrared light	

Category of accessory	Accessory	Description	Application
Detector	Area array detector	CCD, CMOS … (visible light/infrared light)	The detector is usually put on the focal plane of the collimator mainly for receiving targets at infinity. It is usually used for multi-axis aiming, remote sensing, scattering detection, laser communication, etc. It should be chosen according to the receiving target and the application.
	Dot matrix detector	PMT, APD … (for detecting photon information)	
	Linear array detector	For scanning imaging, etc.	
	Optical fiber	For laser communication receiving, signal detection, etc.	
	Other		

Automatic control module

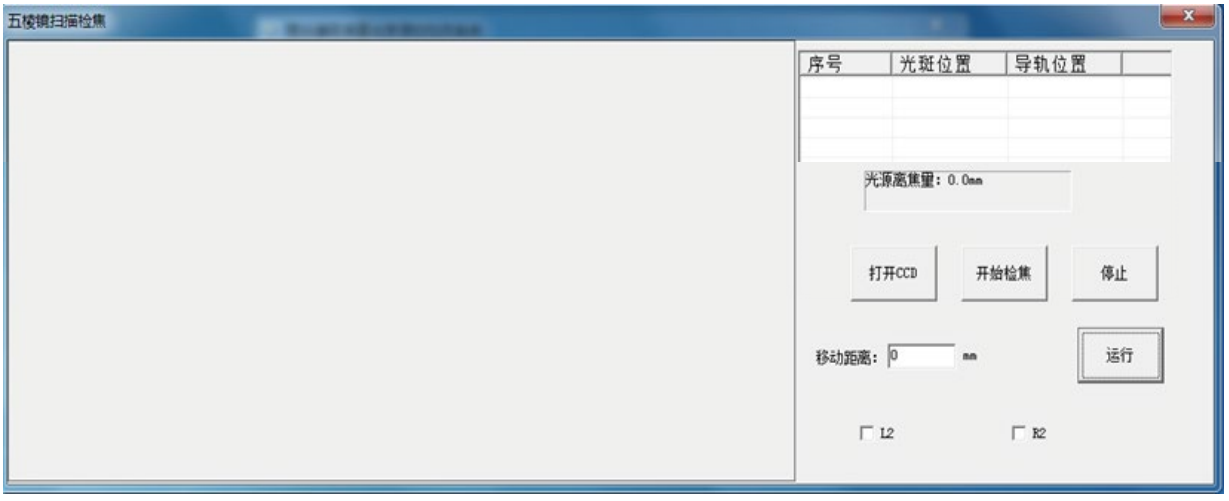
The collimator of the advanced edition has an optional upgrade kit, i.e., an automatic control module with user interfaces.

Switching Interface of Cross Reticle

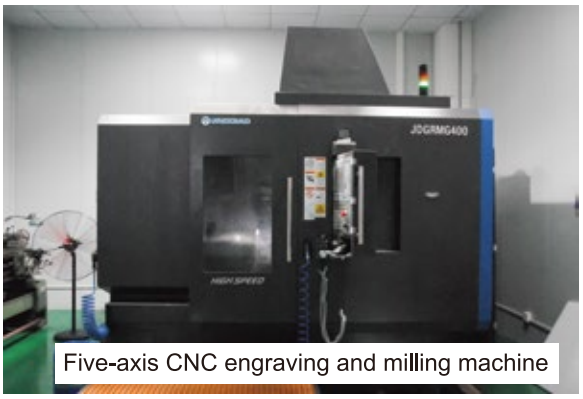


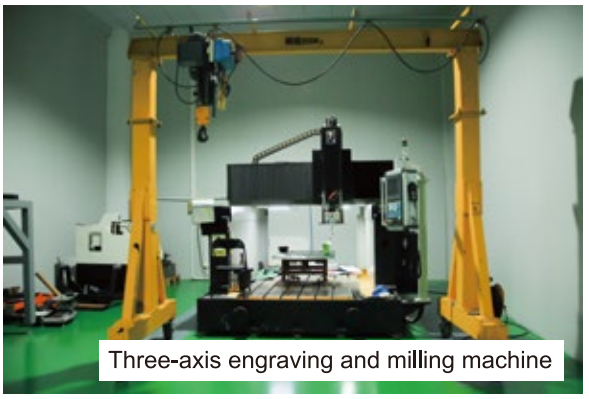
Switching Interface of Light Source and Optical Path

Interface of Auto-collimating Function

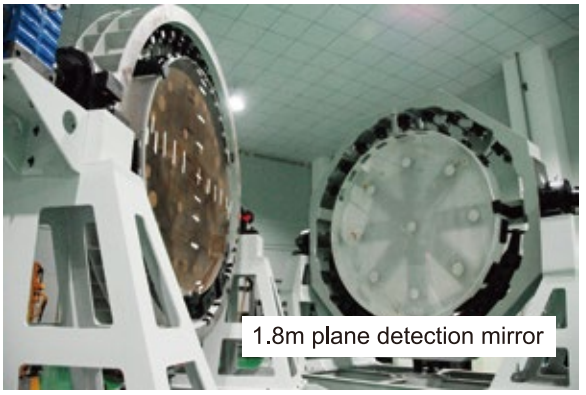


Interface of Automatic Focus Detection and Focusing Function


Five-axis CNC engraving and milling machine


Three-axis engraving and milling machine

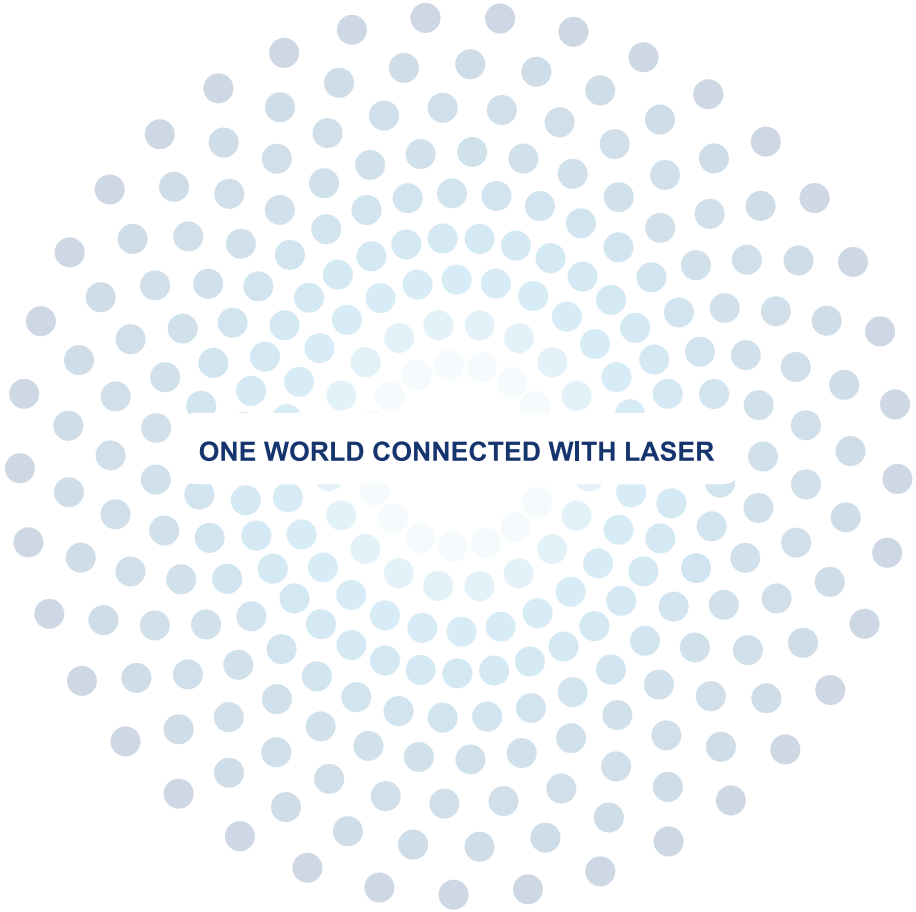

CNC single-axis machine


1.8m plane detection mirror


Three-axis adjusting rack


2m circular polishing machine

2.2m coating machine



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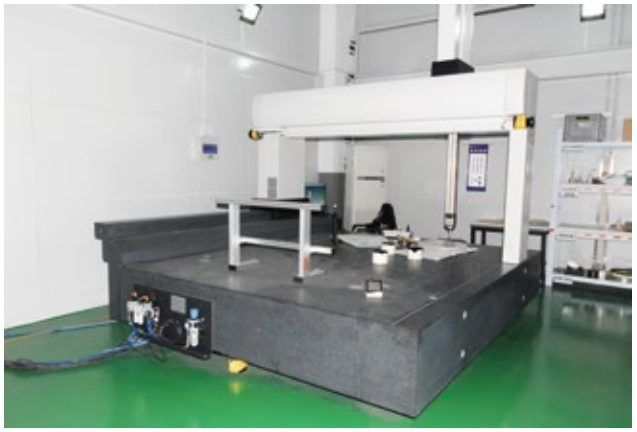
Lens Division: 00-86-25-85282549
Large Mirror Division: 00-86-25-85201220
Coating Division: 00-86-25-82220760



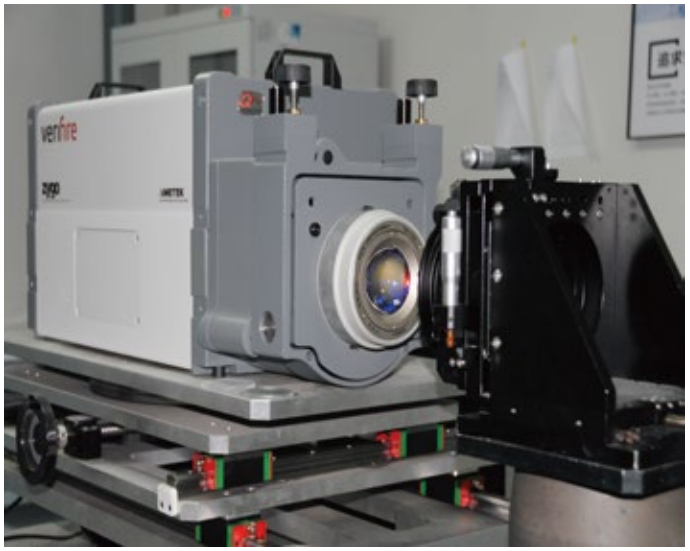
2m ZEISS PRISMO

9m precision vibration isolation optical platform

600 laser plane flat interferometer

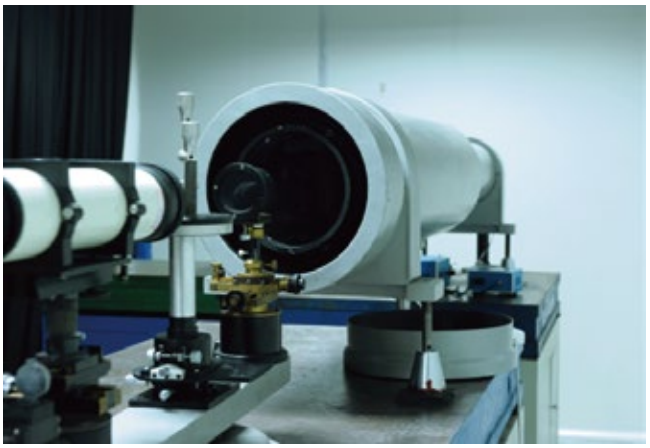
4D interferometer 4020

INTERFERO interferometer



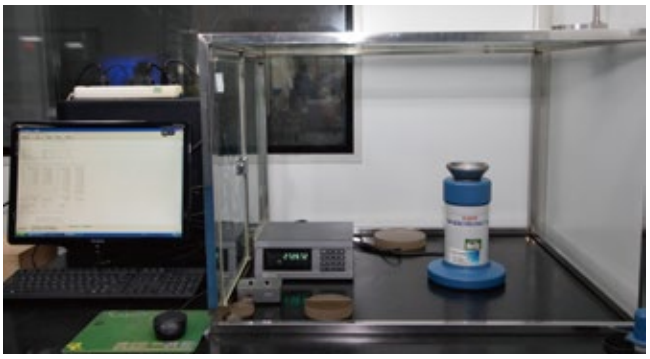
4″ZYGO digital wave flat interferometer

4D interferometer 6000



Collimator

Tool microscope



TRIOPTICS super spherometer

TRIOPTICS centering error gauge

Shimadzu UV3600

Agilent Spectral detector

Profilometer LuphoScan420SD