



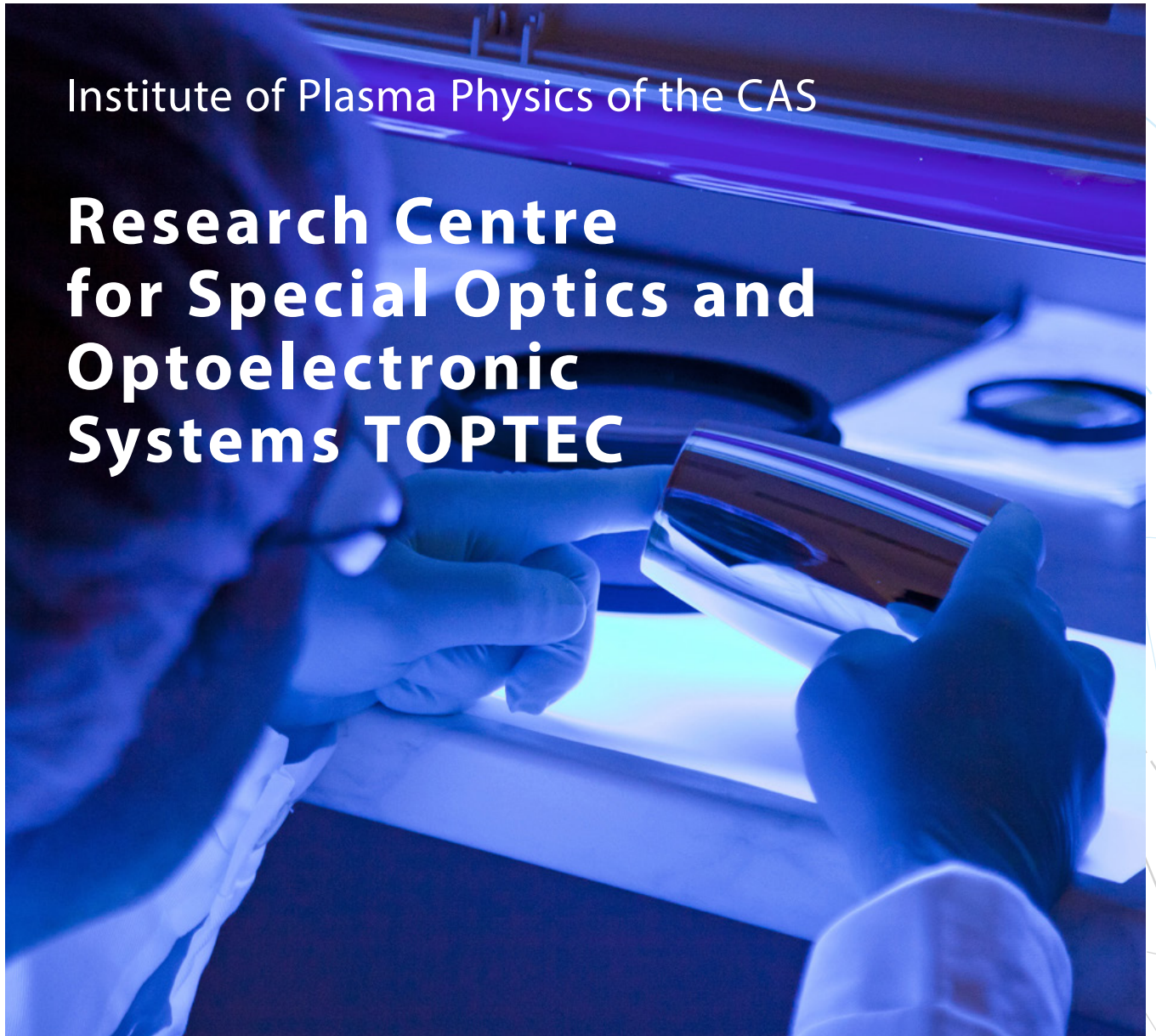
Research Centre  
for special optics  
and optoelectronic  
systems

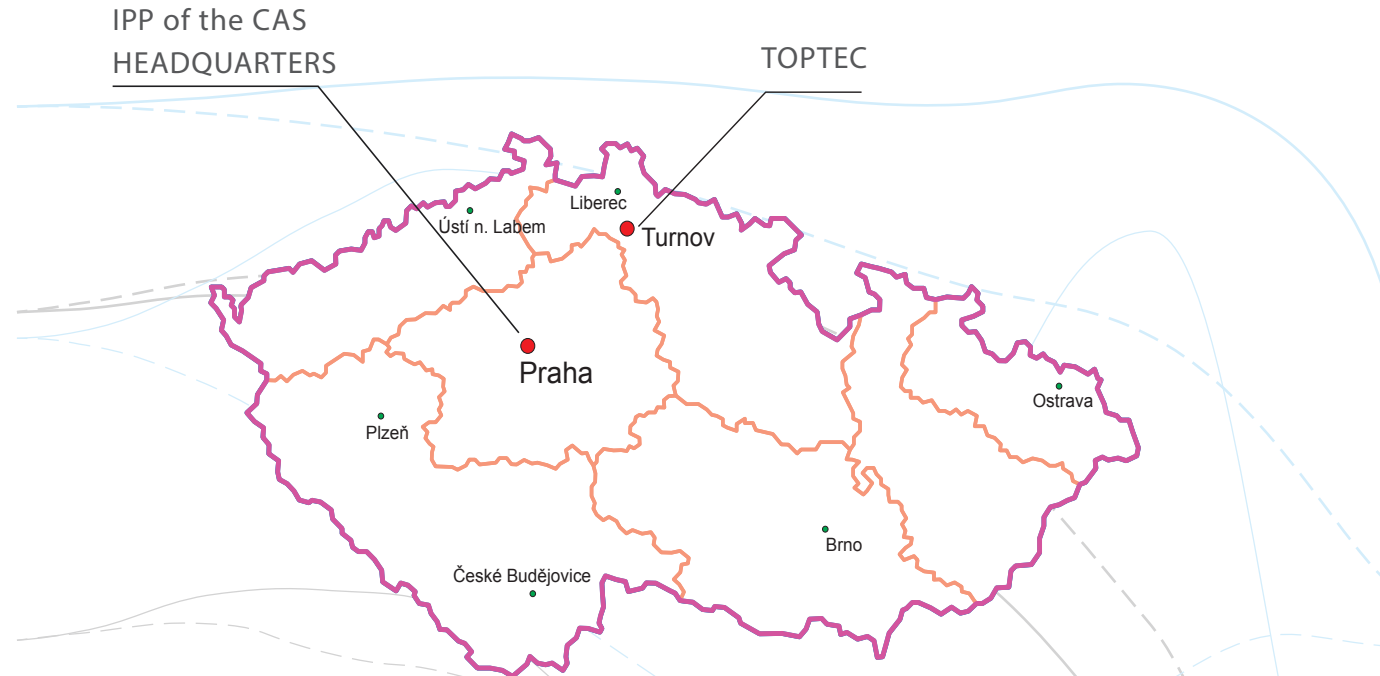
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Institute of Plasma Physics of the CAS

# Research Centre for Special Optics and Optoelectronic Systems TOPTEC





**TOPTEC 50 years  
of experience**

### **Application centre of the CAS**

- Research in optics
- Development of Systems
- Prototype production
- Metrology R&D
- R&D of anuf. processes
- Complex designs

**Institute founded in 1959 –  
nearly 60years of history**

### **Scientific departments**

- Tokamak (COMPASS D)
- Pulse Plasma Systems
- Thermal Plasma
- Material Engineering
- TOPTEC
- Laser Plasma (PALS)

## TOPTEC all around

- TOPTEC – application centre aimed at R&D of precise optics and optical systems
- Located in Turnov – the region with long tradition of optics development and manufacturing
- Turnov optical group – more than 50 years - in 2006 integrated into IPP
- Recently - newly equipped with cutting edge technologies for machining, measurement, software for simulations and design – new laboratory rooms. The team has been extended to 50 employees and 12 students.
- TOPTEC has turnover of about 2,5 M EUR



# Research development and production of precise optics and optical systems

- Aspheric and FreeForm
- Thin film optics
- Ultraprecise measurement methods
- Segments: space, metrology, spectroscopy, high power lasers, diagnostics, automotive
- Optical systems design
- Hyperdimensional detection and spectroscopy
- Fine mechanics



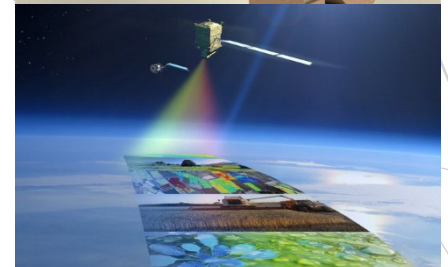
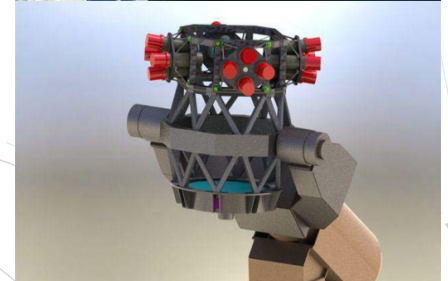
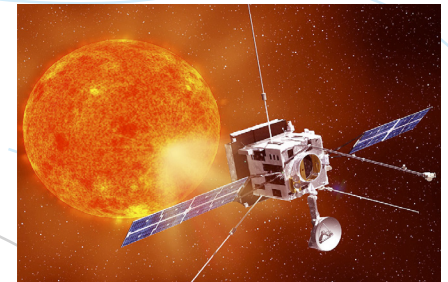


## Selected R&D projects

- PRESO - Partnership for Excellence in Superprecise Optics  
Crytur + Asphericon - „Fundamental research“
- NCK - National Comp. Centers, several specialised topics and teams  
supercoherence lasers, metrology, superpower laser beams
- ERC CZ - ASČR - RUSH - Random Phase Ultrafast Spectroscopy
- Hyperspectral detection system of hazardous substances  
Aim: To develop method and device for fast hyperspectral imaging  
of burning object with regard to detect the hazardous gases
- Digital Holographic tomography of domain walls  
Aim: Research of domain walls growth and movement in ferroelectric  
materials. Digital holographic interferometry / microscopy will  
be used as a method.
- Advanced optical systems using aspherical surfaces  
Aim: Design, manufacturing processes, very good form, low  
microroughness, high cosmetic quality
- High-power modules for fiber laser pumping  
Aim: To develop the new ways of coupling the high power laser  
diodes to fiber lasers

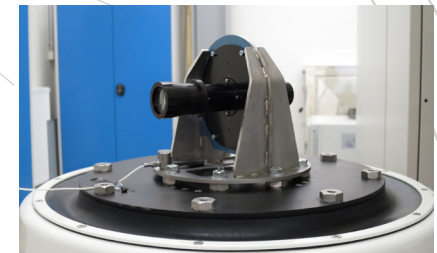
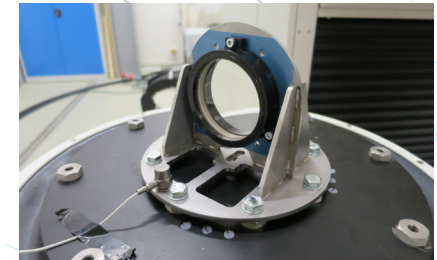
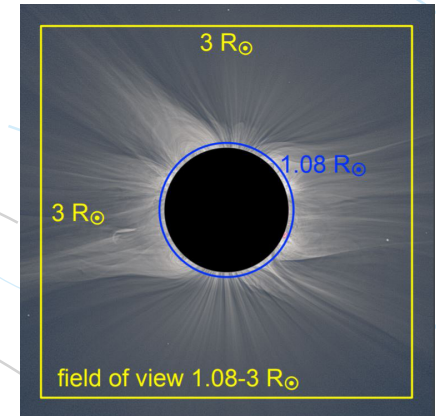
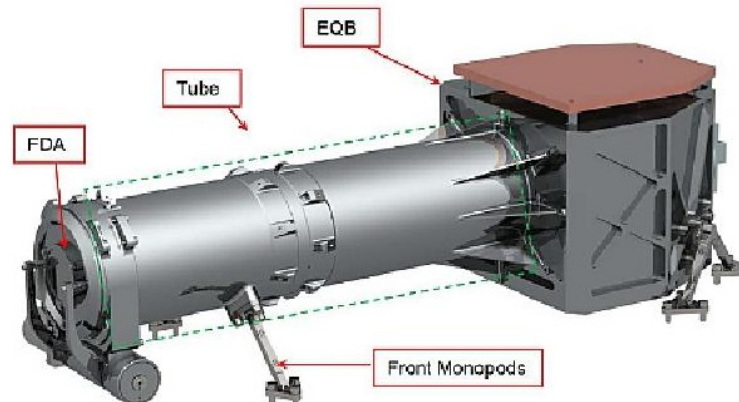
## ESA space research projects in TOPTEC

- **Optical part of the coronagraph on the SOLAR ORBITER**  
Lightweight strongly aspheric zerodur mirrors. Surface with extremely low microroughness for 121, 6 nm EUV
- **Optics of the coronagraph ASPIICS on Proba 3 mission**  
Telescope – redesign and optimization  
Relay optics with aspheres, design and optimization
- **Lenses and whole collimation system for NEOSTEL telescope**  
The set of precision aspheric lenses prototype manufacturing Mechanics design and prototype manufacturing, thin film layers
- **Whole optical system of spectrograph on FLEX FLORIS**  
Optical system design and prototyping
- **Ariel, SAT REVOLUTION, TRUTHS**



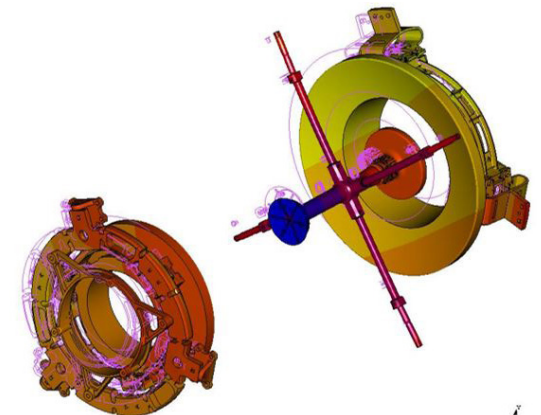
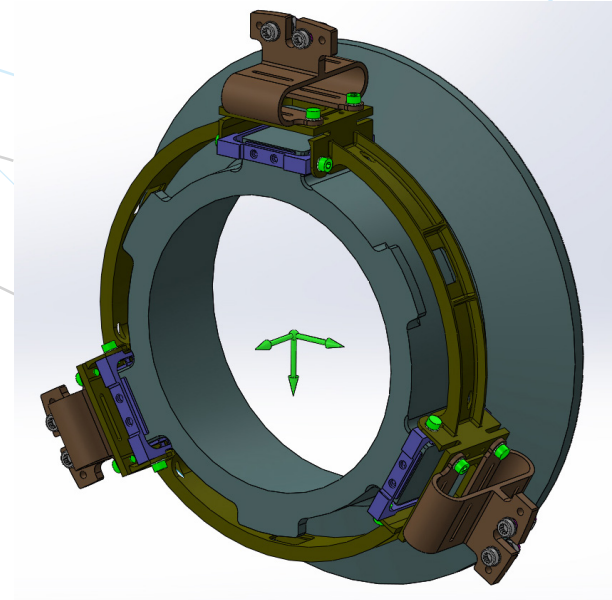
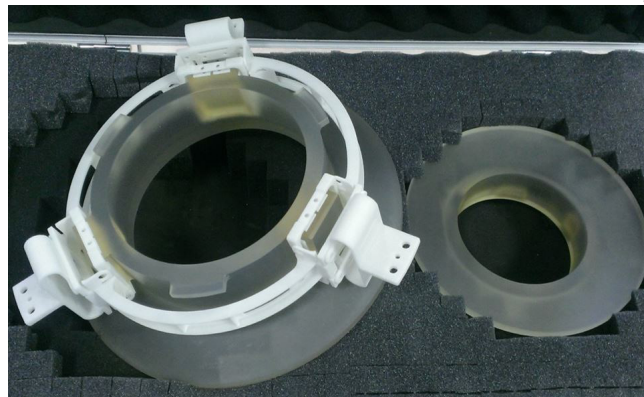
## ASPIICS PROBA III

- Orbit not on LEO but in HEO - why?
- What is the main aim - why?
- Coronagraph and spectrograph
- Noise and surface quality requirements
- Telescope – redesign and optimization -  
relay optics – design and optimization



## Solar Orbiter - Metis

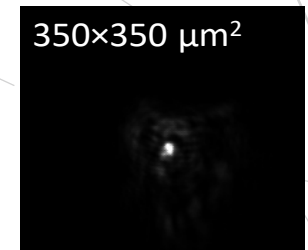
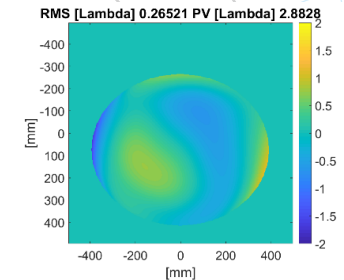
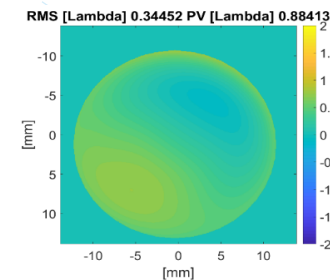
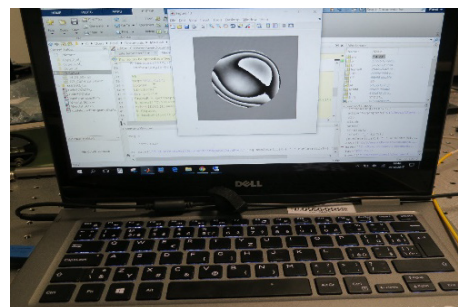
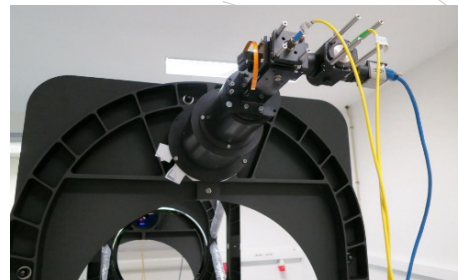
- Coronagraph based on mirr. telescope
- Three super polished mirrors with inner hole, having steep aspherical shape with more than  $50\text{ }\mu\text{m}$  departure from best fit sphere and inner hole. microroughness  $2\text{\AA}$  for 121, 6 nm EUV,
- We try to optimize as much as possible to make the alignment easier





## Neostell Computer assisted alignment

- Why do we need it?
- How to do it?
- Here we used monte carlo optimization and analysis of just spot

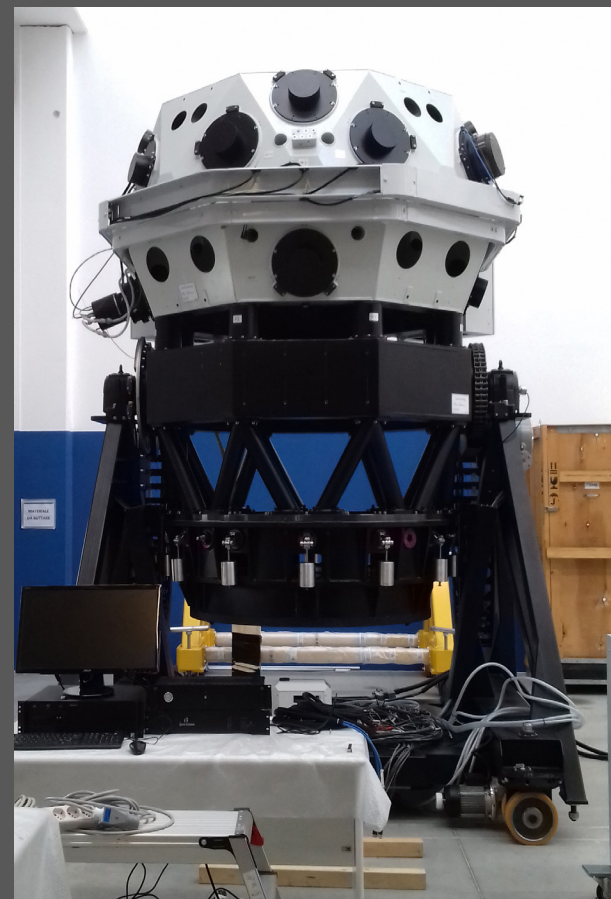




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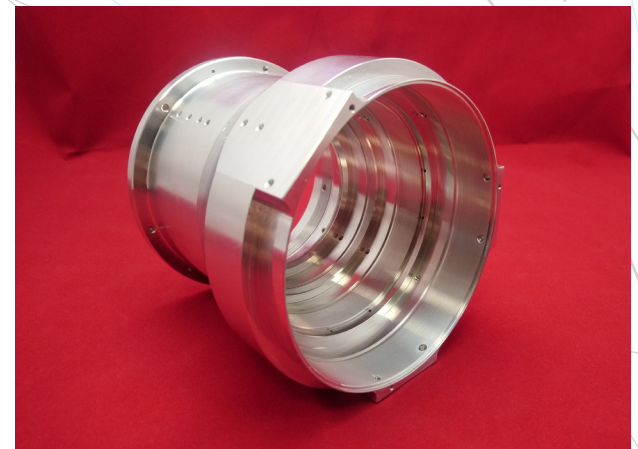
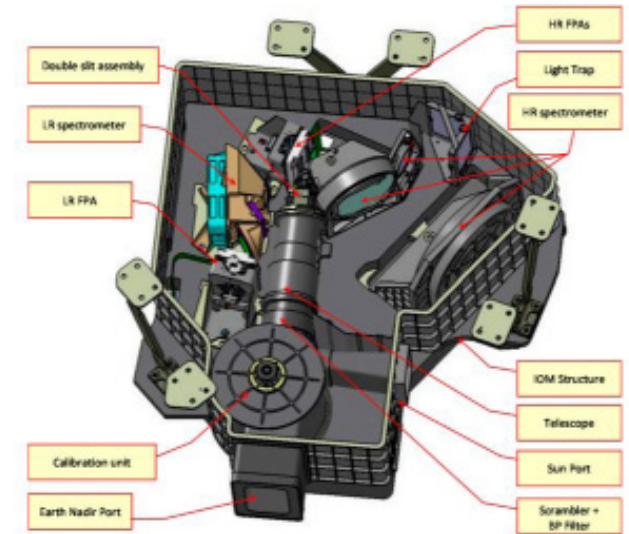
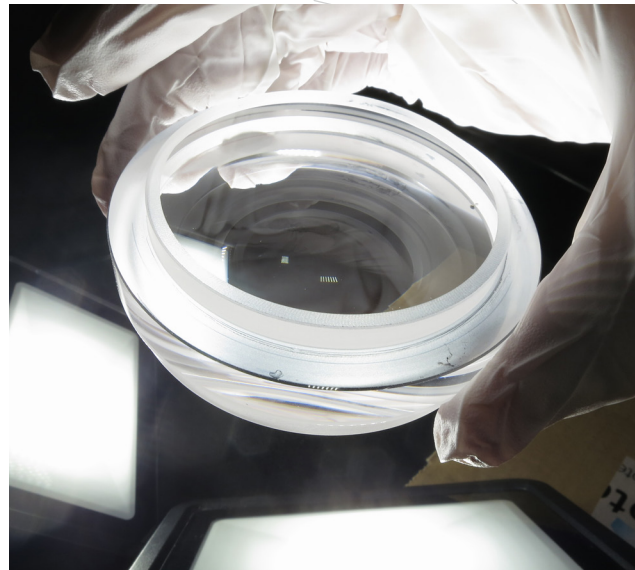
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## FLEX FLORIS

- Highly precise spectrometer
- Chlorophyll fluorescence
- Extremely low stray light
- Extremely low noise
- Mechanics, optics, gluing, design





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**Thank you for your kind attention**

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