

Frist results from the Plasmakristall-4 (PK-4) complex plasma laboratory on board the International Space Station



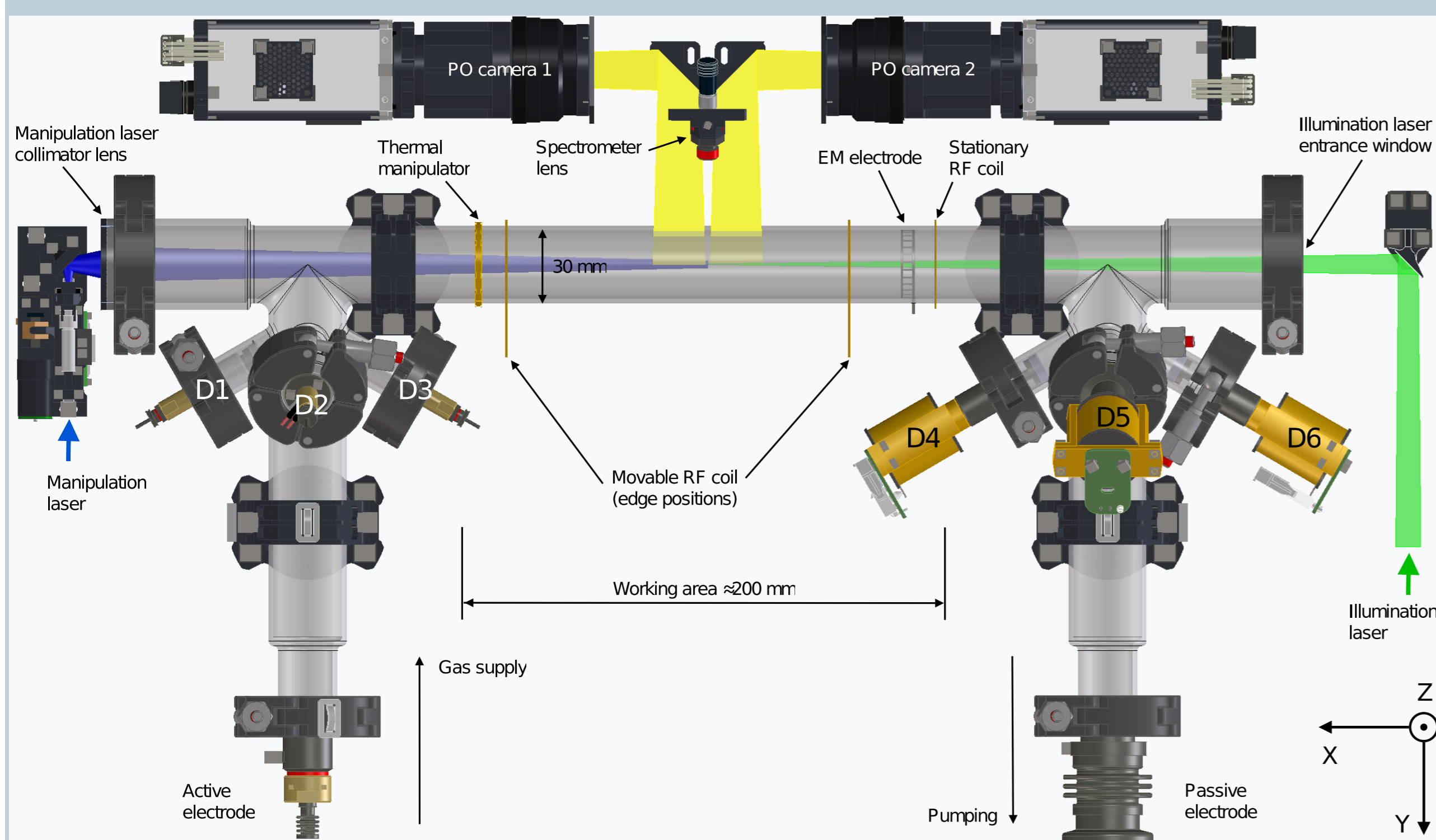
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Complex plasmas

Plasmas containing electrons, ions, neutral atoms, radiation and subsystem of strongly-coupled solid particles. Complex plasmas are considered as particle-resolved models for classical condensed matter physics.

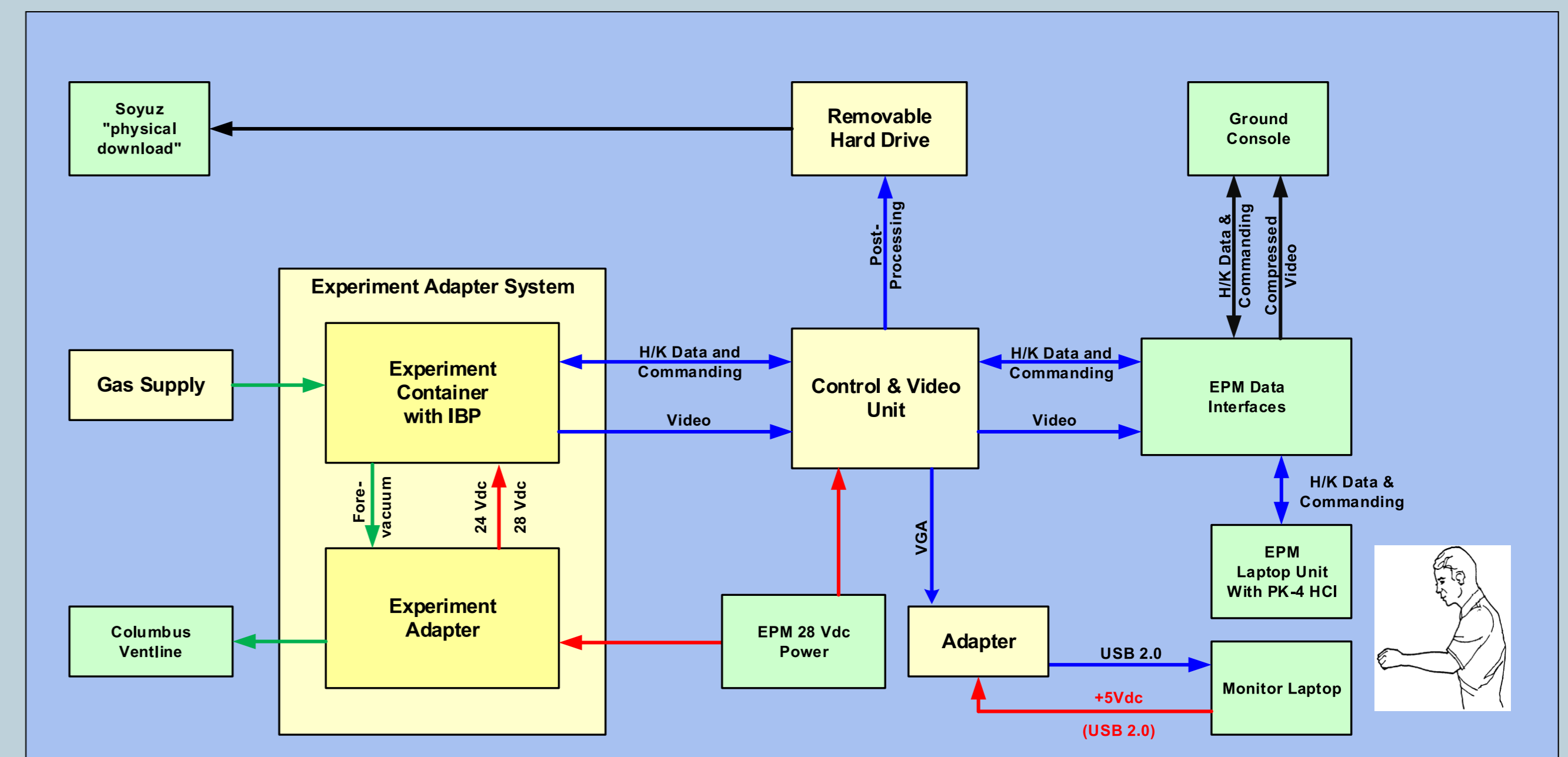
PK-4 hardware

Integrated baseplate (IBP)

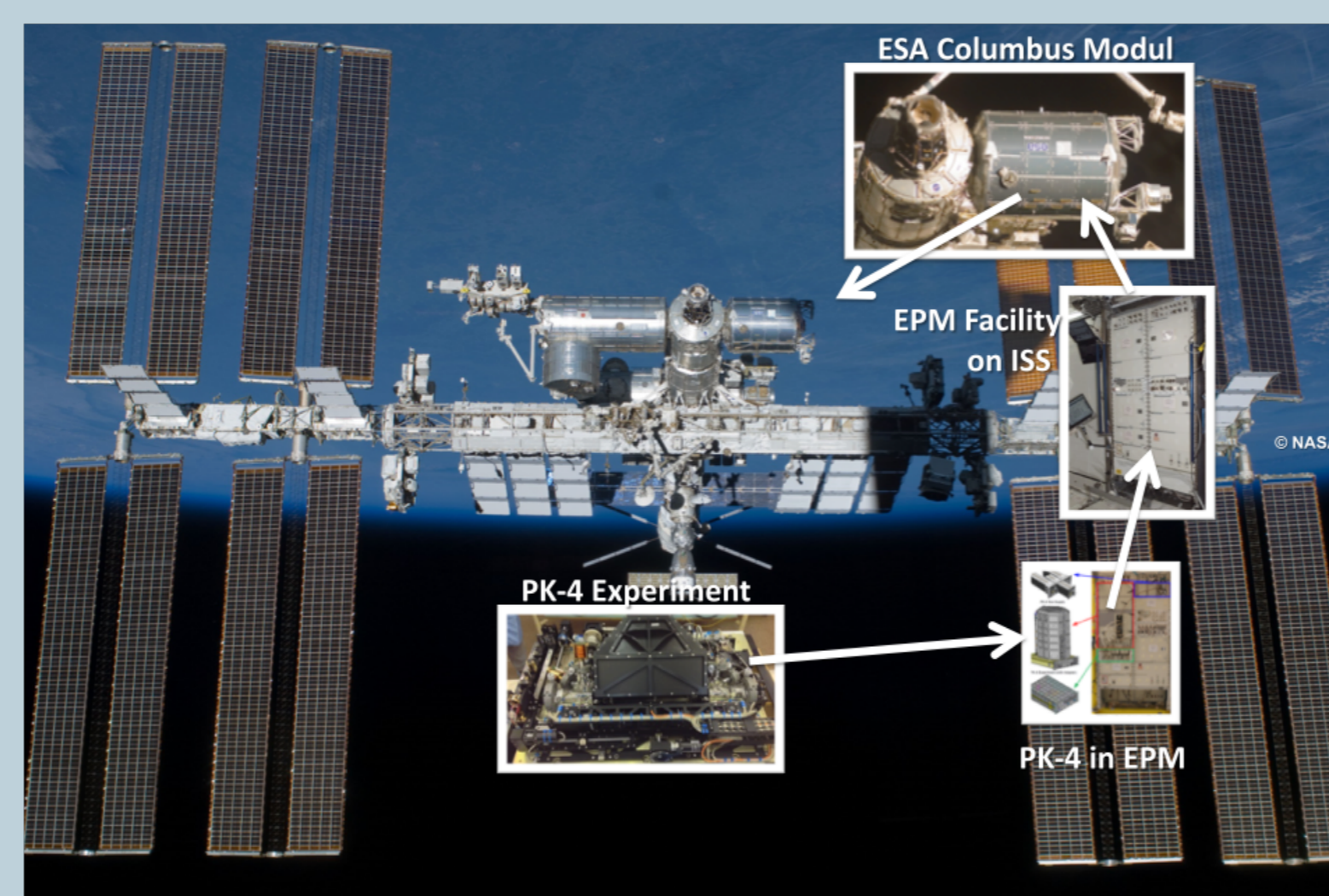


- Designed for flowing complex plasmas
- DC discharge as main plasma source
- Polarity switching in 100 Hz frequency range
- 6 microparticle dispensers
- Various manipulation devices
- Microparticle diameters 1-10 μm

Facility block diagram



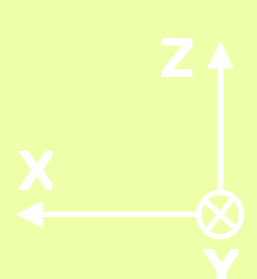
Integration levels



- Accommodation in the Columbus module
- Forevacuum from Columbus ventline
- Control from ground and ISS consoles
- Experiment scripts run on CVU
- Versatile programming language
- 750 GB videodata per experiment run
- 90 min maximal experiment run duration
- Data delivery by Soyuz return capsule

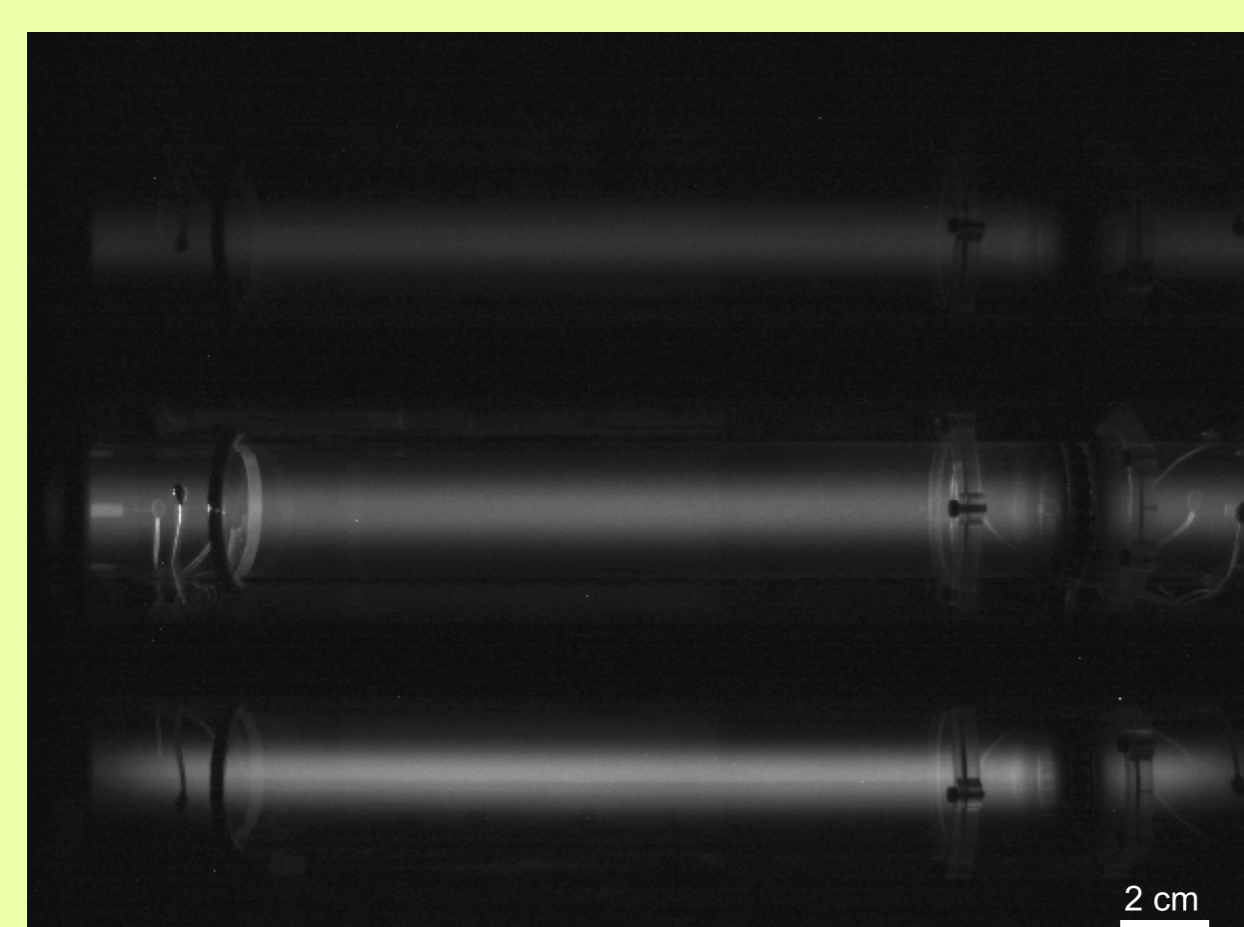
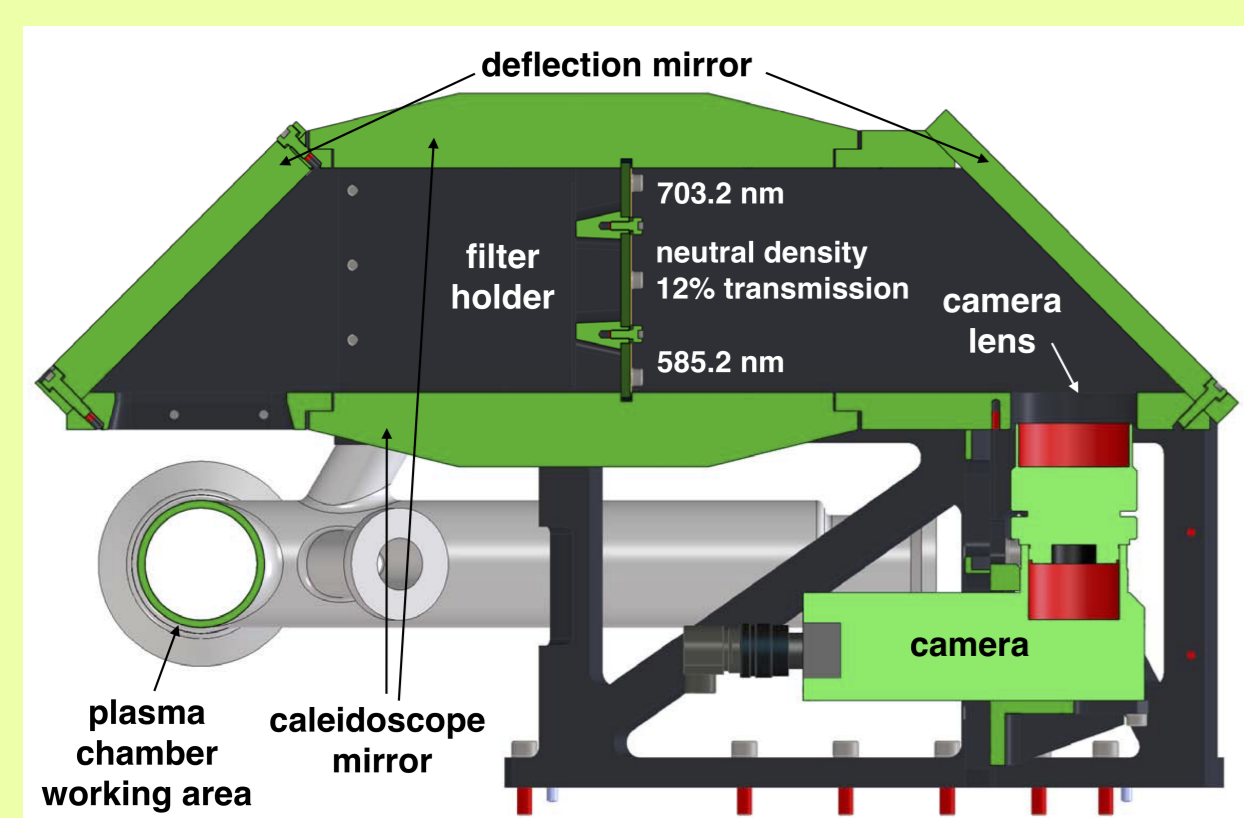
Diagnostics

Field of view

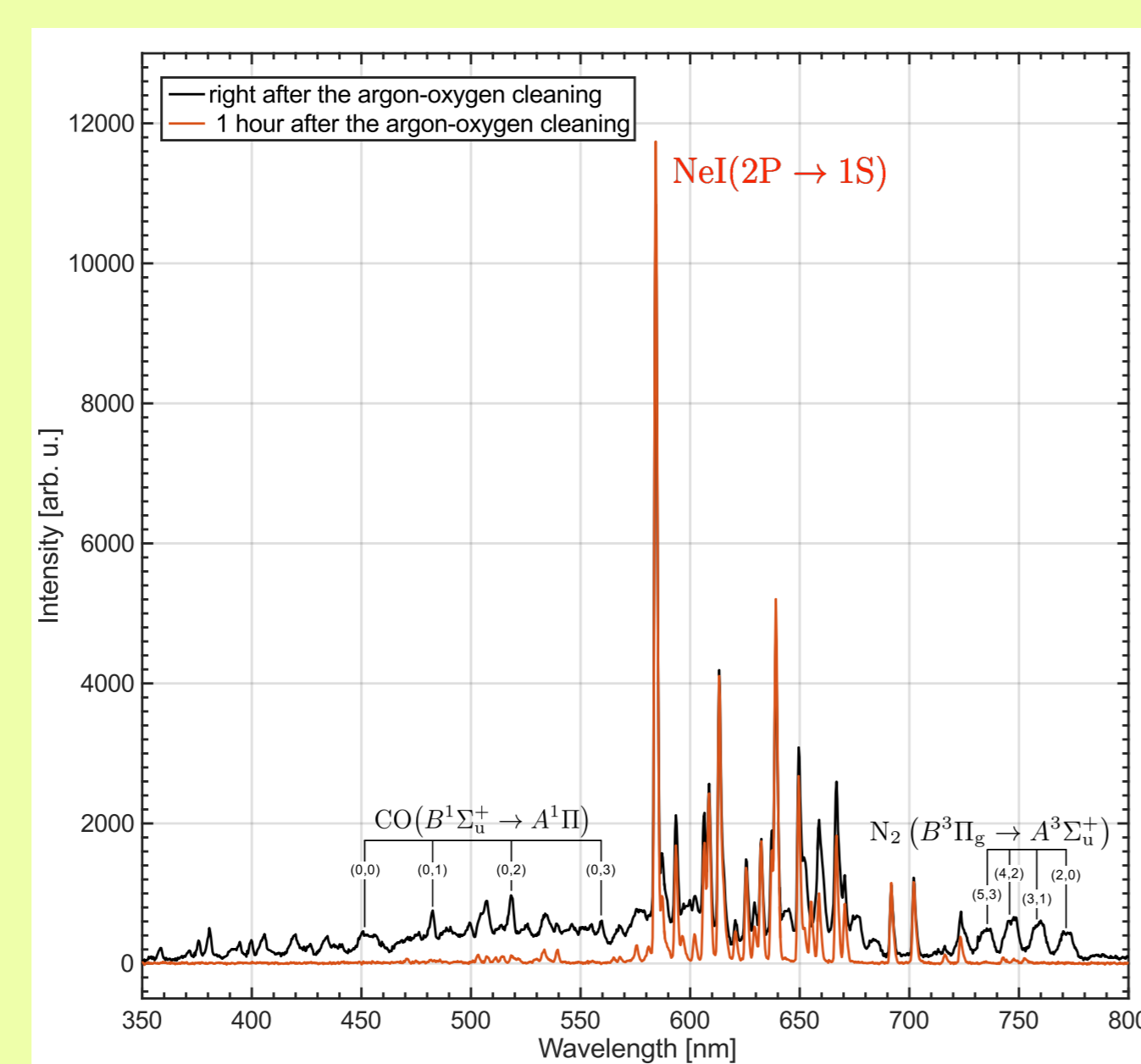


- 2 Particle observation cameras
- Resolution about 14 $\mu\text{m}/\text{pix}$
- Movable in the entire working area

Plasma glow observation



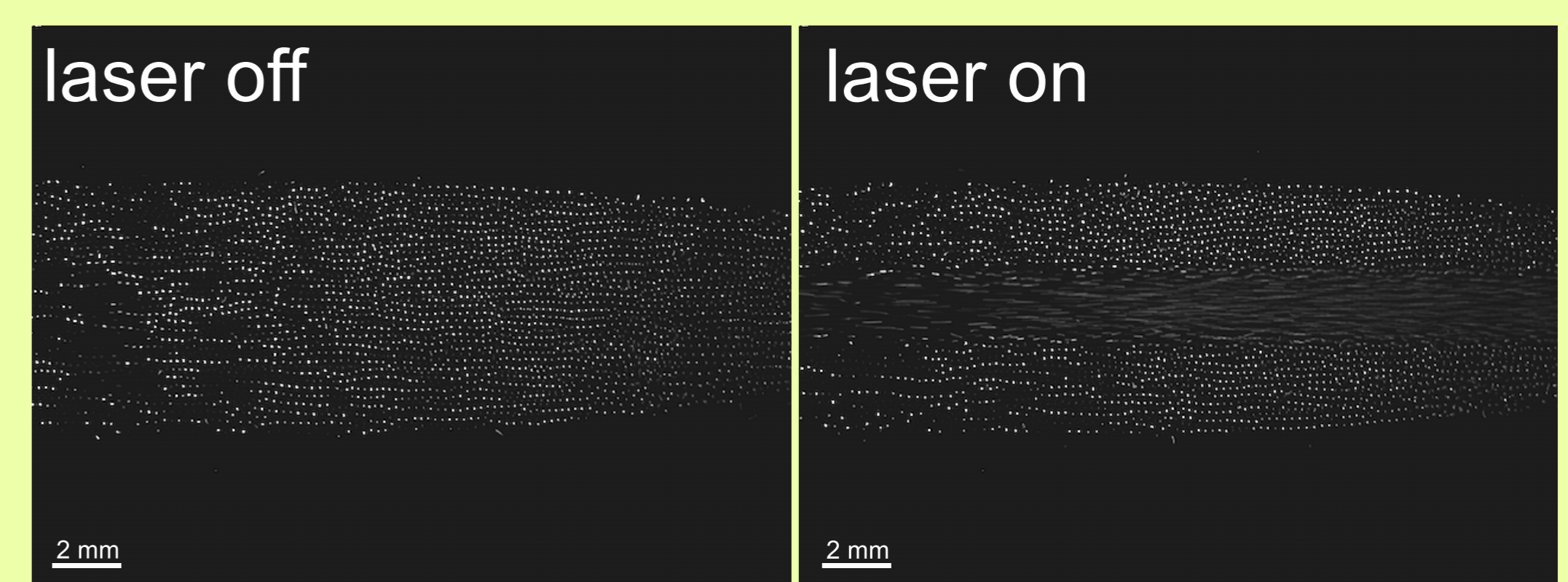
Spectrometer



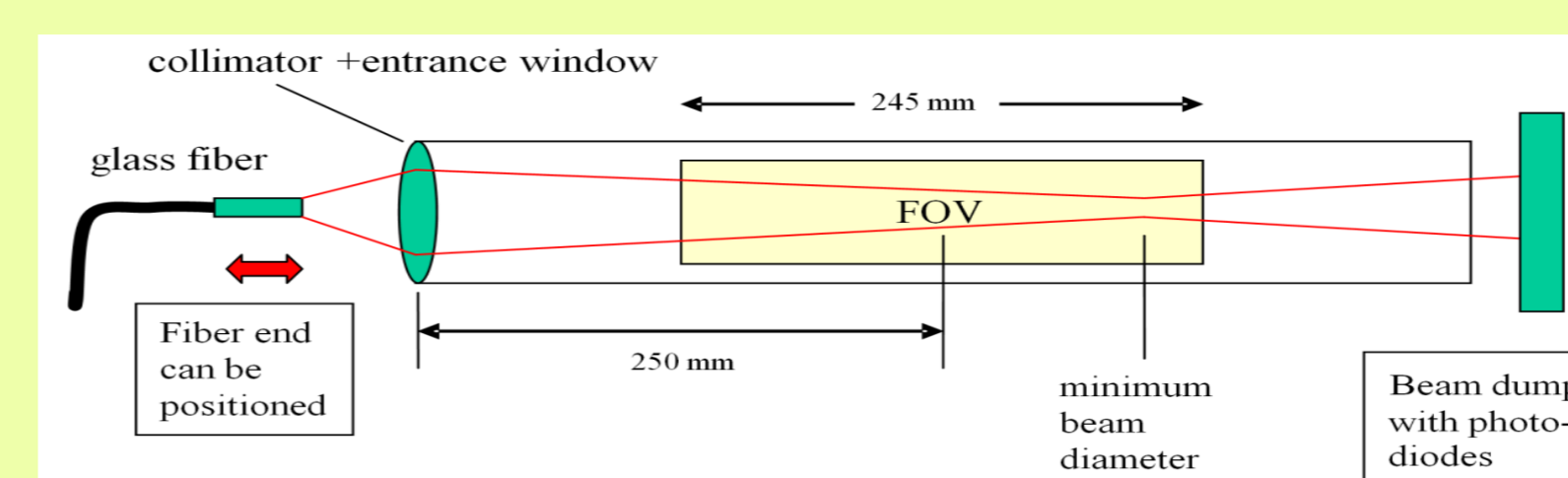
- Plasma diagnostics with 2P \rightarrow 1S lines
- Detection of molecular impurities (N_2 , CO)

Experiment example

Shear flow



viscosity may be determined from the velocity profile in the laser-induced flow



Wavelength 808 nm
Power up to 20 W
Waist about 2 mm

Further science topics

- Electrorheology
- Fluid demixing
- Dust acoustic waves
- Shock waves

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