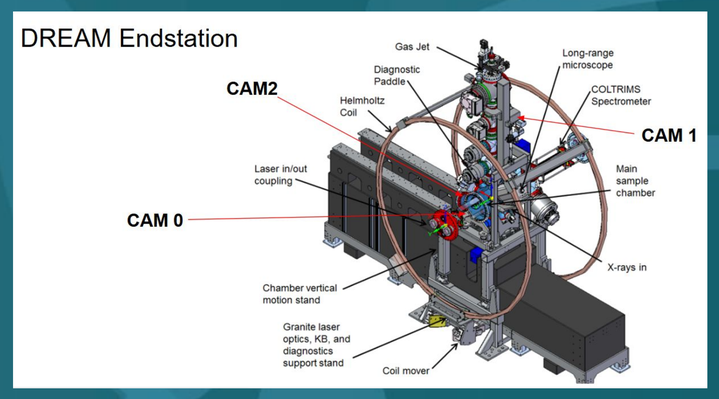
DESIGN and DEVELOPMENT of COMPACT CAMERA MOUNTING SYSTEMS for the DREAM ENDSTATION



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BACKGROUND: DREAM (Dynamic REAction Microscopy) is a COLTRIMS endstation on the TMO soft X-ray beamline at LCLS-II. It measures ion and electron momenta from atomic and molecular reactions while requiring a 0.3 µm X-ray focus, 0.5 µm beam overlap, and 3×10 −11 Torr vacuum.

Cameras are needed to observe alignment and operation near the microscope, nozzle chamber, gas catcher, and gas-jet region. Direct camera placement is difficult because nearby hardware blocks the optical path. The objective was to design three compact, adjustable mounts that redirect the view while attaching to existing DREAM hardware.

Camera 0: Right angle mount

OBJECTIVE

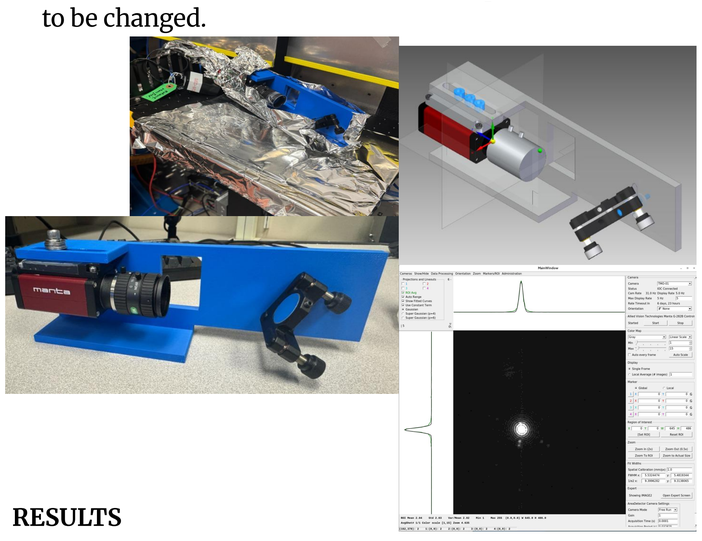
Provide a redirected view at a location where nearby equipment prevents the camera from directly facing the target.

DESIGN REQUIREMENTS

- Create an approximately right-angle optical path.
- Support the camera and adjustable mirror.
- Attach near existing ConFlat-flange hardware.
- Maintain clearance from surrounding equipment.
- Allow camera and mirror repositioning.
- Remain rigid after alignment.

DESIGN SOLUTION

CAM 0 uses an L-shaped support to hold the camera and mirror on perpendicular surfaces. The mirror redirects the camera's line of sight around nearby hardware. Slots and adjustable fasteners allow the camera and mirror positions to be changed.



RESULTS

- Produced and assembled a full-scale prototype.
- Verified the camera-and-mirror arrangement.
- Added a lower support surface.
- Revised slot lengths and overall mount length.
- Enlarged the camera viewing opening.
- Installed the final assembly for location testing.

Camera 1: Sliding flange mount

OBJECTIVE

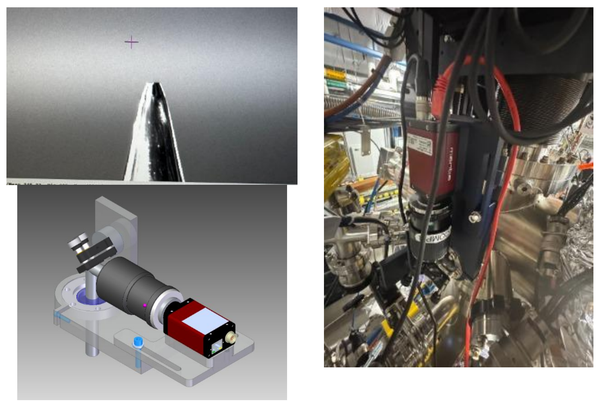
Develop a compact flange-mounted system with independent camera-position and mirror-angle adjustment in order to look at the skimmer directly.

DESIGN REQUIREMENTS

- Clamp directly around a ConFlat-flange location.
- Slide the camera toward or away from the mirror.
- Adjust and lock the mirror angle.
- Minimize the camera-to-flange distance.
- Resist bending from the camera and lens weight.
- Avoid nearby cables and chamber hardware.

DESIGN SOLUTION

CAM 1 combines a sliding camera base, adjustable mirror mount, and integrated flange clamp. The sliding feature changes camera position for focusing and framing, while the mirror provides independent angular adjustment.



RESULTS

- Manufactured the mount using ASA-CF instead of PLA.
- Successfully assembled the camera, lens, mirror, and clamp.
- Added sliding camera and mirror adjustment.
- Attached the system to ConFlat-flange hardware.
- Got clear pictures of the skimmer.

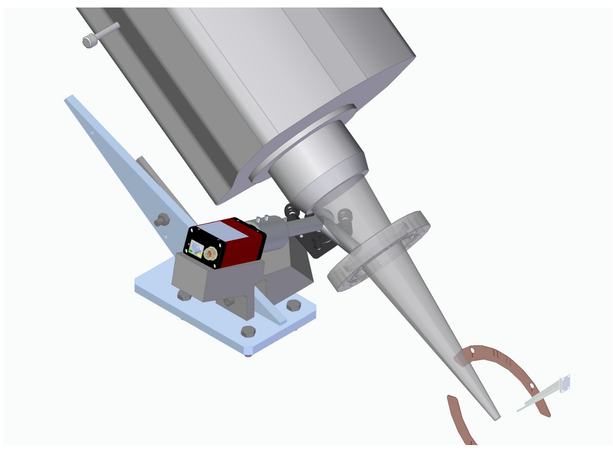
Camera 2: Under microscope mount

Objective

Provide a compact, wide-angle camera view beneath the DREAM microscope while maintaining clearance from the microscope and surrounding hardware.

Design Requirements

- Compact under-microscope geometry
- Wide-angle spectrometer view
- Adjustable camera and mirror
- Minimal microscope obstruction
- Secure, removable attachment



Current Design

The current CAD concept establishes the camera and mirror positions beneath the microscope. An angled mirror redirects the viewing path toward the desired region while keeping the camera out of the microscope's direct path.

Status / Preliminary Results

In Progress: Camera and mirror positioning has been established. The mounting and clamping system is currently being developed. Next steps include final CAD design, fabrication, fit testing, and field-of-view verification.

Acknowledgements

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References

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