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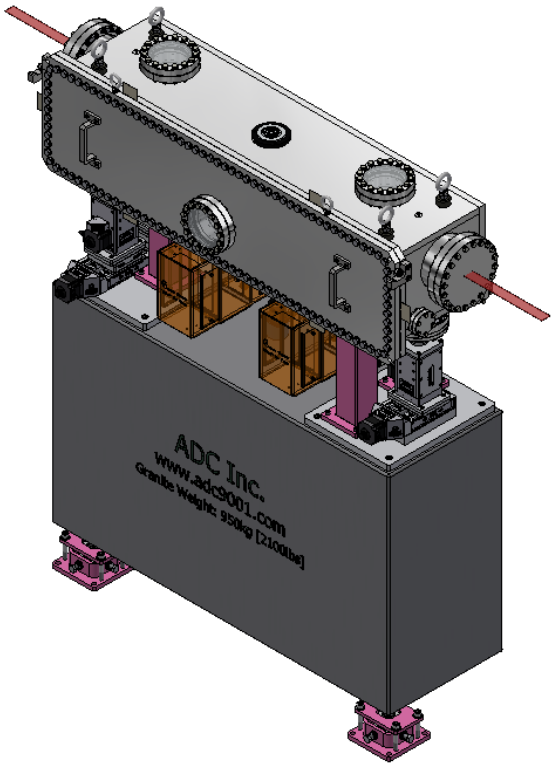
Focusing Mirror System for Argonne

ADC has recently finished the design for a new upward reflecting focusing mirror system for use in Advanced Photon Source (APS) synchrotron radiation 12BM at sector 12.

The mirror system consists of a large vacuum chamber supported by welded steel posts. This arrangement sits on a granite plinth providing great stability. The vacuum chamber has a number of flanges for viewports, ion pumps, and other accessories. Within the vacuum chamber is a Single Crystal Silicon mirror. This mirror can be bent to a radius as small as 8km by using a linear actuator to bend leaf springs within the vacuum chamber resulting in a moment at the ends of the mirror.



Additionally, the mirror can be positioned within the vacuum chamber through the use of ADC's 300 series precision jacks and slides. This series utilizes NEMA 23 stepper motors with Renishaw encoders to achieve great accuracy and repeatability. These are arranged in a way to provide 5 axis of movement to position the mirror.

Mirror Motion Specifications		
Axis	**Range**	**Precision**
X (Horizontal)	±5 mm	5 µm
Y (Vertical)	±10 mm	5 µm
Tilt (about X)	-5 to 10 mrad	2 µrad
Yaw (about Y)	±10 mrad	5 µrad
Roll (about Z)	±10 mrad	5 µrad

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Mirror Specifications

Mirror Material: Single Crystal Silicon

Mirror Dimensions: 1100mm Long x 80mm Wide x 50mm Thick (+/-0.5mm on all dimensions). There are two flats 10mm wide each on top. The sagittal curve will reduce the thickness within the polished zone.

Polished Zone (PZ): 1100mm Long x 60mm Wide minus edge bevels

Clear Aperture (CA): 1000mm Long x 40mm Wide, centered on the optic

Sagittal Radius: 63mm +/-1mm concave

Tangential Slope Error and Radius: 1.5ur RMS with >30KM curve removed on CA (with 1.0ur RMS as Best-Effort).

Sagittal Slope Error and Radius: 20ur RMS with curve removed measured at 5 locations (center, +/-250mm from center, and +/-500mm from center)

Texture: 4Å RMS Measured at 11 locations. The 11 measurements will be averaged using the RSS method to attain the mirror's qualified roughness. Measurements will be taken at the centerline of the mirror along the length.

Coating: 400A Platinum on 100A Chrome binder layer on the Polished Zone (PZ)