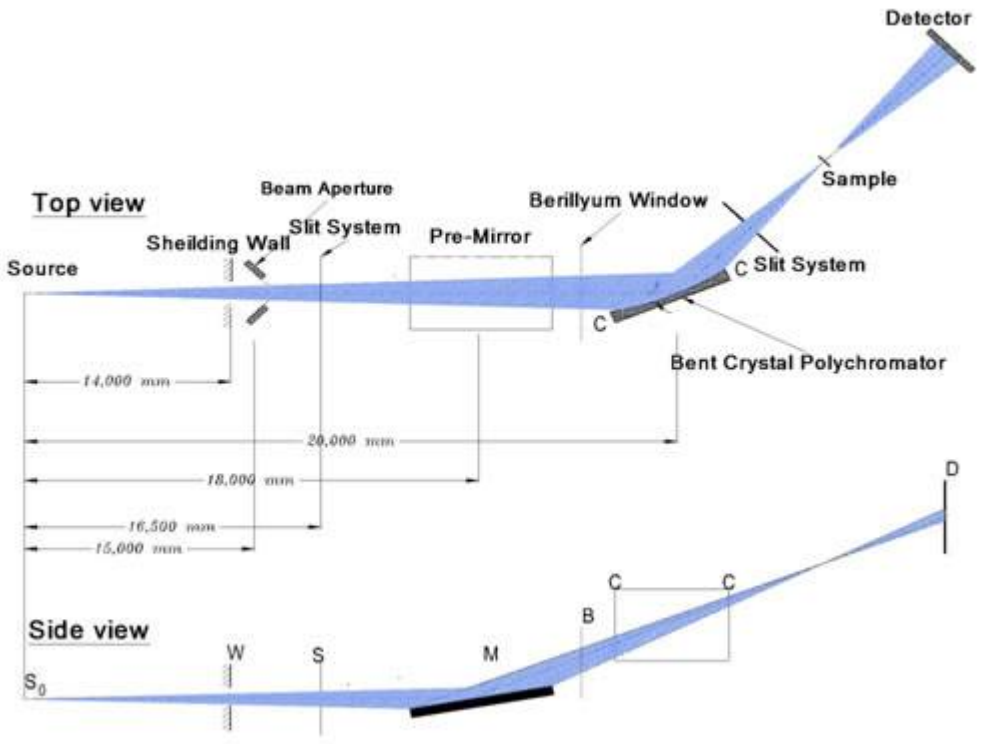
Dispersive EXAFS Beamline, Indus-2 SRS

The Dispersive Extended X-ray Absorption Fine Structure (DEXAFS) beamline has been operational since 2008 at the Indus-2 SRS. The DEXAFS Beamline (BL08) at Indus-2 is dedicated to X-ray absorption spectroscopy in the transmission mode, using dispersive optics. In this beamline a bent crystal (Si 111) polychromator is used to select a band of energy from the white synchrotron beam which is horizontally dispersed and focused on the sample. The crystal is bent in the shape of an ellipse in such a way that source & sample positions are at two focii of the ellipse. The transmitted beam intensity from the sample is recorded on a position sensitive CCD detector, thus enabling recording of the whole EXAFS spectrum around an absorption edge in a single shot (typical acquisition time of one spectrum is ~300 msec). A mirror is used prior to the polychromator for vertical focusing and higher harmonics rejection.

Optical layout



Beamline Specifications

Source	**Bending magnet (2.5 GeV Indus-2 Source)**
Energy Range	5-20 keV
Acceptance	1.5 mrad (H) x 0.2 mrad (V)
Pre-Mirror	Rh coated meridional cylindrical mirror with fixed radius of curvature of 1319m, Horizontally mounted for vertical

	focusing and higher harmonic rejection
Monochromator	Elliptically bent Si(111) Polychromator Vertically mounted on a mechanical bender Mean Radius variable between 2 m to 20 m
Observed Spot size @sample position	250microns(H) x 500microns(V) at 20keV
Observed Resolution	5×10^3 @ 20 keV
	7.5×10^3 @13 keV
	8.5×10^3 @ 11 keV
Photon flux	10^{12} photons/sec/1000eV bandwidth
Typical acquisition time for one EXAFS spectrum	300 msec
Sample Environment	Mount available for various forms of samples viz., powder, pellets, liquids etc. High temperature (450° C) reaction cell to study in-situ kinetics for pellet samples

Experimental Station

The experimental station consists of a θ-2θ goniometer with a telescopic 2θ arm on which sample and detector stages are mounted. The polychromator is mounted on the θ axis. Both θ and 2 θ motions are independently controlled through a PC. The telescopic arm moves on a granite slab with pneumatic air pads. Sample and detector stages are provided with remote controlled X-Y-Z and tilt mechanisms. Sample stage has facility to mount 12 samples (maximum sample dia: 25mm) at a time; any sample can be brought into the beam path for transmission measurement remotely. Generally samples in pellet or powder form can easily be mounted on the sample holder. Liquid samples confined in a proper cell with x-ray transmission window can also be mounted. A high temperature (upto 750K) cell, which can accommodate sample up to 12mm dia, is available for temperature dependent EXAFS studies. A low temperature sample environment will also be inducted soon in the beamline.

Features

Angular resolution of goniometer	**18arcsec**
2 θ range	-5 to 45 degree
Sample and detector manipulations	X, Y (±15mm), Z (-10 to 35mm), tilts(±50)
Sample environment	Air/vacuum
Sample temperature range	300 to 750 K

Photograph of the Beamline

Facilities at the beamline:

- ✓ 2T magnet for XMCD measurement
- ✓ Set up for High Pressure EXAFS Measurement