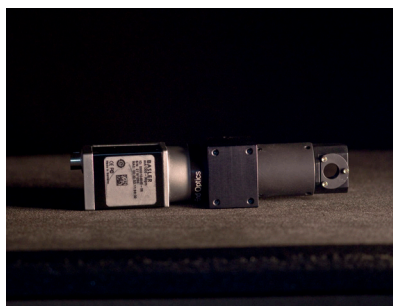


Air Beam viewer

The ESRF has developed a set of air X-ray beam-viewers integrating a GigE CCD camera. Our compact version, is used for focused X-ray beam visualisation, beam movement monitoring and imaging with a small field of view. It consists of a scintillator to convert monochromatic X-rays into visible light, front-end optics and a CCD camera.

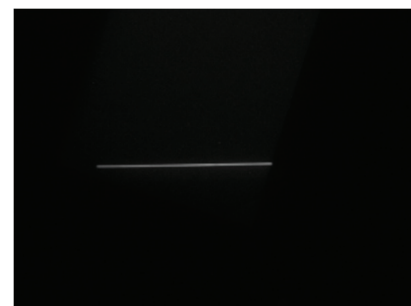
- ◆ **Auto-calibrated - very compact, light plug-and-play instrument**
- ◆ **High accuracy of measured position and wide dynamic range**
- ◆ **High-energy and/or intense flux applications with a 90° folded head**



*Focus Analyser Viewer
2x and 1x magnification 90° folded head*



Beam spot from X-ray multilayer optic "FOX3D" of lab source into unfocused plane at 8keV and 4.108ph/sec



5µm width tungsten slit image

CHARACTERISTICS

Dynamic range of integration from 22µs to 10sec, 10bit true dynamic range and 30 frames per sec in full resolution (1.2Mpixels) or 50fps in VGA mode.

<i>Beam viewer</i>	<i>Magnification</i>	<i>Input pixel size (µm)</i>	<i>Resolution (pixel)</i>	<i>LSF (µm)</i>	<i>Input field of view (mm²)</i>	<i>Comments</i>
<i>FAV 0.8x</i>	<i>0.8x</i>	<i>4.7</i>	<i>1280x960</i>	<i>15</i>	<i>6x4.5</i>	<i>30fps, 7mm diag. field of view</i>
<i>FAV 1x</i>	<i>1x</i>	<i>3.75</i>	<i>1280x960</i>	<i>10</i>	<i>4.8x3.6</i>	<i>30fps, TTL synchronisation</i>
<i>FAV 2x</i>	<i>2x</i>	<i>1.87</i>	<i>1280x960</i>	<i>6</i>	<i>2.4x1.8</i>	<i>30 fps, TTL synchronisation</i>
<i>FAV 3x</i>	<i>4x</i>	<i>0.93</i>	<i>1280x960</i>	<i>3</i>	<i>1.2x0.9</i>	<i>Under design</i>

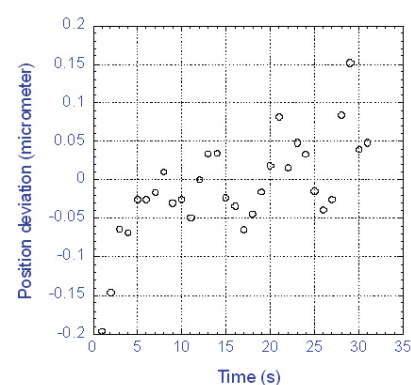
Experimental results

Line spread function (LSF) and position accuracy for a 1x magnification beam-viewer



Left and below: A 90° folded head with mirror is integrated into a small, light body. The design is radiation-resistant and provides 10 μ m spatial resolution with 3.75 μ m pixel size.

Right: The X-ray beam position is determined in two directions with sub-pixel accuracy over a large energy range. The accuracy of the position measurement is 65nm for 100 μ m beam size and 3.75 μ m pixel size at 8keV.

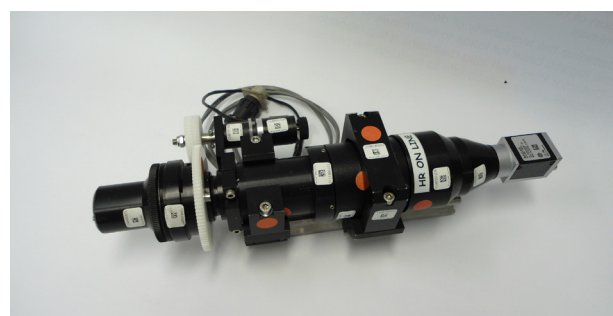


Our expertise

The ESRF detector group can provide expertise in the choice of the converter screen.

The ESRF has developed garnet (GGG) and lutetium orthosilicate (LSO) thin film scintillators which can be integrated in the X-ray beam viewer to boost the contrast [1] in the 1 to 3 μ m range.

The ESRF has also developed a high-magnification lens-coupled detector, from 4x to 60x, which is suitable for C-mount adapters. The design allows fast imaging associated with spatial resolution enhancement (below 3 μ m). A stepper motor ensures precise focusing of the microscope lens.



In-line detector on beamline ID06 at the ESRF [2,3]

Publications

- [1]: Recent development in X-ray imaging with micrometer spatial resolution, *J. Synchrotron Rad.* (2006) 13, 180-194
 [2]: X-ray Nanointerferometer Based on Si Refractive Bilenses, *Phys. Rev. Letters* 103, 064801 (2009).