Photonic Science
Scientific Detector Systems

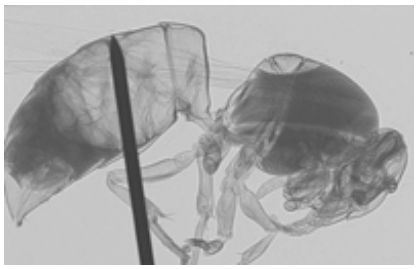
X-ray Phase contrast and DEI imaging

Phase Contrast Imaging

Photonic Science delivers a new generation of Very High Resolution X-ray CCD detectors with 16 megapixel resolution for high coherence homelab X-ray source

The contrast in x-ray images is normally generated by the difference in x-ray absorption for different materials. However, the x-ray absorption coefficient is roughly proportional to the fourth power of the atomic number Z, making the imaging of objects consisting of low -Z elements like carbon, nitrogen and oxygen difficult.

As an example, soft tissues in a body give very low contrast in medical x-ray imaging when no contrast enhancing media are used. For nearly all elements the real part d of the complex index of refraction n (n = 1 – d + ib) in the x-ray region is larger than the imaginary part b. As a consequence, the phase shift of any object is stronger than the absorption, and the difference between d and b becomes larger with increasing energy. When a high resolution camera is used with a coherent micro focus source, phase contrast is obtained by fractionally adjusting the sample to detector distance.



5 micron source 30kV Operation, 10W/micron

Courtesy Excillum, Sweden

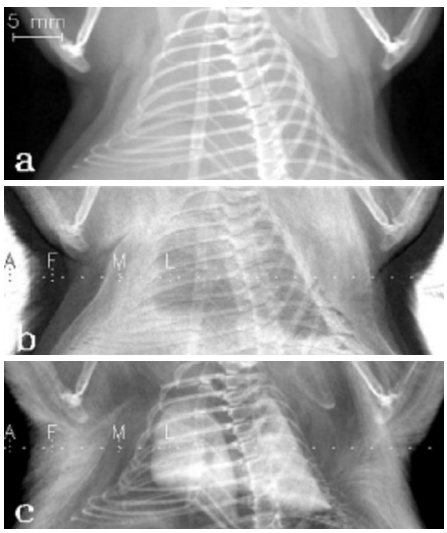
Diffraction Enhanced Imaging

Photonic Science delivers a new generation of very High Resolution X-ray CCD detectors with 11 megapixel resolution for DEI set up on homelab and synchrotron sources

DEI technique is providing very fine angular refraction and extinction contrast that allows to unveil amyloid accumulation in pre alzeilmer brain sections. A very good spatial resolution is necessary as well as the possiblity to acquire in real time alternatively 2D images and or 1D scans.

The system consists of a microfocus source combined with specially designed X-ray optic and analyser tandem that selects a specific angular range of X-rays through the VHR detector.

The exposure time is mainly limited by the source as a the analyser will cut significantly the transmitted beam.



a standard transmission image
b & c DEI image with 10 micro radian difference

Courtesy Z.Zhong BNL

Recommended Detectors

X-ray VHR detector
X-ray Image Star detector
X-ray FDI

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