XFEL Camera

A Large Camera for X-Ray Free Electron Laser (XFEL) Studies

Introduction

XCAM specialises in producing custom and prototype CCD cameras for leading-edge science experiments all over the world. On request, XCAM produced a peltier and water-cooled camera that can house the e2v Technologies CCD42-90 or CCD44-82 sensors for an XFEL experiment.

Figure 1: Large Dual Unit Camera with Adjustable Central Slit

Slit Separation and Adjustment

Minimum slit width is 300 microns, Maximum slit width is user-definable
Distance from edge of image area to edge of CCD package is 300 microns for each CCD.

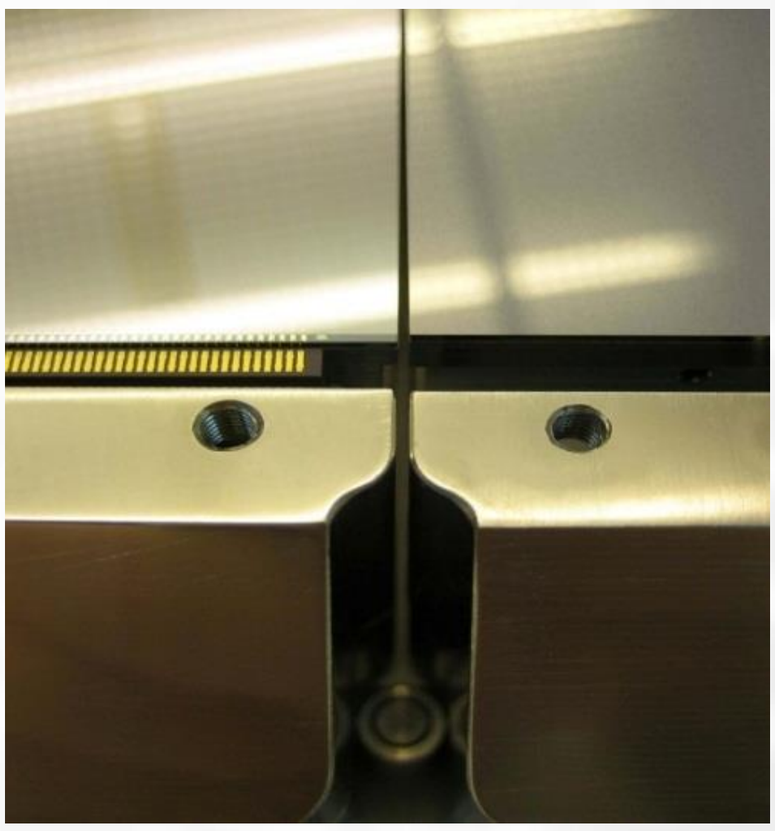

Figure 3: Showing Gauge Bush detail used to precisely set CCD separation down to 300 microns

Features of the Dual Unit CCD Camera

Direct Detection: Photon detection from 100eV to 20keV possible

Vacuum-Compatible Construction: All vacuum compatible materials and processes are used, and can be adjusted to suit customer's preferences or requirements. Camera can reside inside vacuum chamber or interface via an O-ring seal or conflat flange.

Software/Hardware Triggering: Starts Erase and Integration sequences, for synchronisation with experiment. Custom triggering schemes.

Full Software Control: Options available are (1) XCAM application software (2) user-written software to call .dlls to control system or (3) XCAM written custom control software.

Extended Dynamic Range Operation available for use in challenging environments eg Free Electron Laser experiments in which single photon detection is required in outer part of image, and full-well capability in centre of image.

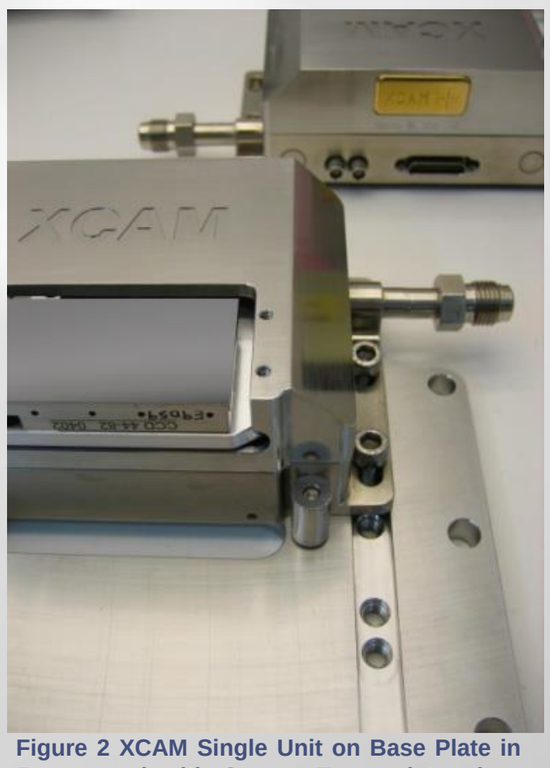

Figure 2 XCAM Single Unit on Base Plate in Foreground with Sensor Exposed to view, and (background) Alternative Orientation

Total pixels (dual unit camera):

CCD42-90: 4608 x 4096
CCD44-82: 4096 x 4096

Total image area:

CCD42-90: 67.3 x 56.4 mm
(plus slit width and dead space)
CCD42-82 61.4 x 61.4 mm

Multiple Camera Combinations

The design of the camera permits their use in a number of configurations, such as the configuration shown below which makes them suitable for SAXS/WAXS type diffraction studies, where both small and wide angle diffraction detail needs to be captured.

Multi-Synchronisation sequencer cards permit multiple CCDs to be operated in synchronisation for low noise performance.

Recent software developments enable multiple CCD camera systems to be operated with a single PC through the XCAM software.

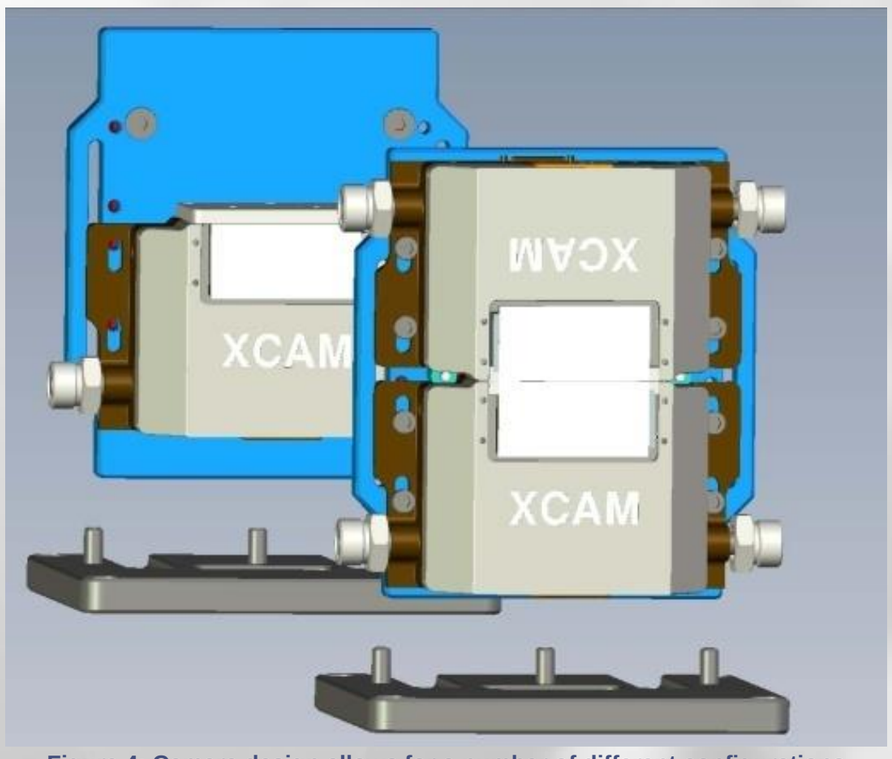

Figure 4: Camera design allows for a number of different configurations

Extended Dynamic Range

Systems offered provide novel techniques that offer extension to the dynamic range that is usually offered by CCD-based systems.

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