

Custom CCD Solutions

Introduction

XCAM specialise in producing CCD systems that are tailored to your application:

- CCDs in camera heads customised to suit your space envelope, vacuum interface or other specific requirements
- Unusual Operating Modes
- Unusual Readout Modes
- Multiple CCD Focal Plane Arrays
- Systems with custom CCDs, Large Area CCDs, Scintillator-coupled CCDs
- Test and Characterisation work, including QE calibration to national standards

Example of a Masked CCD Operating in an Unusual Mode





This system was built to work as part of a system performing a *Cavity Ring-Down Spectroscopic (CRD)* examination of Atmospheric Pollutants.

In this case, the CCD is required to detect the tiny fraction of exponentially-decaying light which is transmitted through one of the mirrors, and to operate in a mode which permits the decay constant to be determined. The resulting spectrum temporal resolution is around 2 microseconds.

These two images show the CCD with a *very precisely-aligned mask* fitted to its surface, which leaves just 5 horizontal rows of the CCD uncovered. The CCD operation, is as follows:

- The CCD starts integrating upon receiving a trigger but <u>ALSO</u> the image is progressively shifted downwards during integration, permitting the decay constant to be monitored
- At the end of the integration the image is shifted to the store section
 Upon receipt of the next trigger the image is shifted up to precisely the
- same position as last time and the integration starts again • Repeat a user-specified number of times (typically 1000) to build
- spectrum up

Ultra-Fast, Multiple-Windowed Spectroscopy

XCAM has developed a camera system for *high frame rate multi-fibre optical spectroscopy*. In this system, up to 16 user-selectable windows are defined on the CCD image and sampled, providing up to *3200 spectra per second*. This technology was initially developed for fusion reactor diagnostics.



X-ray Spectroscopy and Multi-spectral Imaging





The CaF spectrum is of a powder sample that has a 3% CaF component, superimposed on an Fe-55 spectrum. A KEY advantage of using this photon-counting spectroscopic technique is that *an image is obtained at the same as a spectrum.*

Using the CCD's ability to provide energy resolution of individual photon events provides spectral information at the same time as spatial information is acquired. In the image shown above, three images (top) of 9 mm latex spheres acquired simultaneously using multi-spectral imaging at 3.3 keV (Au-M), 1.7 keV (Ta-M) and 5.0 keV (Ti-M) and (lower) a projected density distribution obtained by phase retrieval from the three images

Custom Headboards and CCD Packaging

We can provide operating CCDs in configurations permitting operation in most space envelopes and environments

Custom-packaged CCDs mounted on peltier cooler for insertion into an SEM





A very large area CCD chip with 4096 x 2048, 13.5 mm pixels; XCAM is the only manufacturer offering this chip in a standard camera head.



A bare, large area chip, for a *multi-spectral imaging application*, wire-bonded directly to a headboard for insertion into vacuum equipment.



A CCD with a *scintillating fibre-optic* stud attached for hard X-ray detection

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