



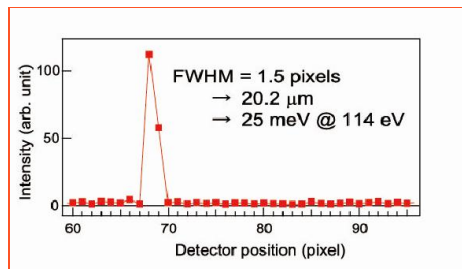
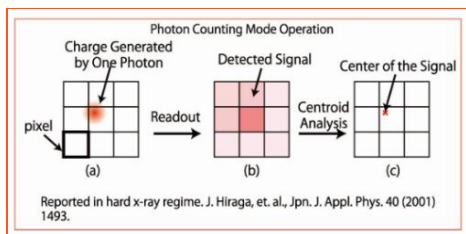
# Sub Pixel High Resolution Soft X-ray Spectroscopy

## Introduction

The Institute of Molecular Science (IMS) developed a transmission grating spectrometer (TGS) for soft X-ray emission studies. They contacted XCAM to develop a camera system to perform their experiments and this was delivered in 2007.

The experimental configurations demanded a sub pixel resolution of  $5\mu\text{m}$  which XCAM exceeded by writing custom software to measure the centre of the generated charge cloud using a centroiding algorithm.

*The delivered resolution was 3 microns FWHM representing 1/5<sup>th</sup> of a pixel resolution*



## Camera System

In the case of soft X-rays one photon produces a charge cloud of which the total intensity is about 10 times weaker than hard X-rays. In order to analyse the centroid of the charge cloud the intensity of the nearby pixels must be accurately measured. This requirement is out of the reach of conventional scientific CCDs and so we used an EMCCD in order to reduce the effective readout noise whilst increasing the readout rate to 10 frames per second.



The device used was an uncoated, back illuminated e2v technologies CCD97 with  $512 \times 512 \times 16$  micron pixels. The devices had no AR coating as is standard for this device, and XCAM produced a mechanical shield to enable frame transfer operation in the absence of the aluminium shield.

The figure below shows a schematic of the method developed.

