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## 1" CCD CAMERAS FOR NEUTRON & X-RAY IMAGING

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### Introduction

We will describe three proven applications of 1-inch CCD cameras to neutron and x-ray imaging, as recently provided for Indonesia, Thailand & Malaysia. The 1-inch ICX694ALG is Sony's largest CCD, with high efficiency and exceptionally low noise.

### 250x200 mm neutron/x-ray imaging camera

Our ICX694ALG camera can be compared to the excellent, but much more expensive, Andor and PCO cameras using sCMOS detectors [1,2]. sCMOS, like CMOS, has lower read noise but higher dark current, making it better for fast data acquisition on high flux sources. But there is little advantage for the many users in Universities or Institutes with low flux reactors or generators, where the lower dark current of the CCD, with similar efficiency, is an advantage. Fig.1 shows our camera, a neutron image obtained on a 100 kW Triga reactor and an x-ray image obtained on a 120 kV x-ray source; low flux neutron images were obtained in as little as 5 seconds.

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### 1:1 macro & Laue backscatter cameras

Fig.2 shows our 1:1 macro imaging and Laue cameras. with a backscattered x-ray pattern (center). We use the ICX694ALG for all these types of cameras.

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### References

1. A W Hewat, Phys.Proc. 69, 2015, pp 185-8.
2. <http://neutronoptics.com/news.html>
3. We thank the IAEA Vienna for support for developing laboratories

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