

## Using High-Performance Cameras for Advanced Plasma Diagnostics

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Digital cameras are a staple in the toolbox of every experimenter and diagnostician. With improvements of noise floor, amplification, resolution, and clock speed, state-of-the-art cameras have grown beyond a mere means of recording static images.

We will present insights, challenges, and recent progress on using a multi-megapixel deep-depletion CCD camera for quantitative X-ray spectra in a single-hit exposure mode in order to optimize X-ray diffraction experiments. Care must be taken to shield the detector from electrons and X-ray scatter events, as well as choosing the correct read-out and amplification modes of the camera electronics.

We will also present some applications of Sandia's in-house developed hybrid CMOS (hCMOS) sensors, which can record up to four full frames of optical or X-ray images in sequences with only a few nanoseconds interframe timing in a single line-of-sight. This is accomplished by directly storing image information on the sensor instead of moving the image data into a separate memory array. Our hCMOS sensors have been used to visualize fast processes in High Energy Density Physics (HEDP) experiments, and we will show a few examples from experiments at Sandia's pulsed power and laser facilities.

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