Contribution ID: **137** Type: **Poster**

Quantum and charge collection efficiency measurements back illuminated CCDs in the soft X-ray regime

Thursday 7 September 2017 13:00 (1h 30m)

Soft X-ray CCD detectors are a valuable resource in a variety of fields including spectroscopy, astronomy and nuclear science. For astronomy in particular, the CCD sensitivity can have a dramatic effect on observation time and the attainable signal to noise ratio. Quantum efficiency (QE) is the standard metric used for CCD sensitivity, but it can be defined in multiple ways. The photon counting QE is a measure of photons in to photons detected, and can be measured in the soft X-ray regime using event detection algorithmns. The diode QE is the ratio of charge collected to charge expected, and is Charge Collection Efficiency (CCE) multiplied by the photon counting QE.

Here we present quantum and charge collection efficiency measurements of the Teledyne e2v CCD97 in the soft x-ray regime. We measure two types of devices: a standard process device, and an enhanced process device. The enhanced process device features improved back surface passivation, and extra doping intended to increase the QE in the soft X-ray regime. We show the success of this enhanced process, and present accurate QE models for both basic and enhanced process devices for use in simulations.

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Session Classification: Poster session