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Using a CCD for the direct detection of electrons in a low energy space plasma spectrometer

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Low energy plasma spectrometers for space science typically use micro channel plates (MCPs) with position sensitive anodes as detectors behind their analyser heads (electrostatic optic energy selecting filters). MCPs however require high vacuums and high voltages which can add challenges and complications for the design and implementation of an instrument.

As an alternative at MSSL we have been using an E2V CCD64 back illuminated, full frame, scientific x-ray CCD as an imaging electron detector for testing and calibrating a highly miniaturised prototype plasma spectrometer analyser head. The small size of the analyser head makes it well matched to the size of the CCD which has a much smaller detecting area than that of the MCP detectors that most traditional plasma spectrometers demand. Simulations, the experimental setup and results will be discussed and the application of CCD detectors to such calibrations evaluated.

The CCD is being considered as a possible detector for use with the prototype analyser head for a proposal for a low altitude sounding rocket flight. Although it cannot detect the lowest energy particles an MCP can detect, and it is more sensitive to stray light, the low voltages required and the lack of vacuum requirements make it an attractive candidate. Further trade-offs of the CCD with the different detector technologies available for the proposal will be discussed.

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