

High resolution imaging and timing using capacitive division

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The capacitive division image readout (C-DIR) is a mechanically and electronically simple charge centroiding readout for single photon imaging detectors such as microchannel plate (MCP) detectors. It is purely capacitive in nature, and this endows it with a) very high signal bandwidth allowing MCP-limited time resolution, and b) low capacitance measurement nodes, allowing improved signal to noise charge measurement and correspondingly finer spatial resolution at high throughput.

We describe an implementation of an MCP detector with C-DIR, optimised to provide combined high spatial and temporal resolution in single photon counting operation. The C-DIR is instrumented with high-speed front-end electronics utilising a fast waveform digitizer with a sample rate in excess of 1Gsample/s.

We present results of the spatial and temporal resolution, and throughput of the detector system, and discuss the possible design variations which trade off performance parameters against each other.

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