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The operation of ultra-small pore Microchannel Plates as imaging X-ray detectors

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We describe the operation of ultra-small pore Microchannel Plates (MCPs) as detectors for soft X-ray radiation. These new plates represent a marked improvement in MCP technology. Typical plates at present have pore diameters of ˜8-12μm, whereas the new generation have diameters ranging from 3-6μm. This reduction in pore diameter will clearly have a positive impact on the spatial resolution of a detector with MCP limited imaging capabilities. In addition, the reduced pore diameter will also improve the timing characteristics of the detector (reduced rise time and pulse width) as described theoretically by Fraser et al 1990 and references therein. Burle Electro-Optics have recently reported a 2μm MCP but have not investigated it for X-ray photon counting, only as a time of flight ion detector. They find pulse widths of <400ps and rise time of <200ps.
Our work represents the first investigation of ultra small pore detectors in saturated mode for X-ray imaging. We report, pulse counting and timing capabilities of 6, 4.5 and 3.2μm Photonis MCPs operated in saturated (photon counting) mode using a standard electron bombardment X-ray source to produce the required X-ray lines (C-K - 0.28keV, Cu-L - 0.93keV and Si-K - 1.74keV).

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