Latest Advancements in Microchannel Plate Imaging Detectors

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Microchannel plates (MCPs) are a two dimensional array of holes in glass and act as electron amplifiers when biased in vacuum such that any input quanta that can release a photoelectron (e.g. photons, electrons or neutrons) will result in an avalanche of charge that determines the location and time of the input interactoin. Spatial resolution on the order of the MCP channel pitch and temporal resolution less than 200ps have been demonstrated for indivudual quanta. Much of these performance characteristics are dependent on the readout technologies (e.g. delayline, cross-strip, pixelized ROICs) and optimization of the detector for various application involve tradeoffs between count rate, sensitivity, lifetime, resolution, power and mass. At the Space Sciences Laboratory, Berkeley, we have developed detectors for many space missions (e.g. COS on Hubble, FUSE, EUVE), but also biological imagers that measure fluroescence lifetime, neutron tomographic imagers and time of flight electron/ion spectrometers.
In this talk, I will review MCP detectors in general, discuss their strengths in various applications from low flux astronomy to bright beamlines as well as their weaknesses and our recent efforts to address them.