

Amorphous Silicon Microchannel Plates: A new photon detector with 10 ps timing and 15 μm spatial resolution

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In this work, we present the principle, development, functionality, and characterization of a new type of photon detector. The technology of amorphous silicon Micro-channel plates (AMCPs) uses a versatile approach to stack hydrogenated amorphous silicon in thicknesses up to 100 μm , using plasma-enhanced chemical vapor deposition and etch microchannels of diameter 2 μm , every 4.5 μm , on a hexagonal pattern, by deep reactive ion etching. Five generations of these devices have led to significant improvements in specifications. The versatile fabrication process allows etching of funnel-shaped channels, leading to an active area close to 100%. Measurements have shown excellent timing resolution ($\sigma < 10$ ps FWHM) for low incoming fluxes, along with a maximum single-channel gain around 1500, in reverse voltage of 500 V. The flexibility of the fabrication processes allows to grow the detector directly on top of a CMOS cascade of low-noise amplifiers with a spatial resolution of 15x15 μm^2 , offering 400000 channels on chip.

Field

Detectors and electronics

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