

# Amorphous Silicon Microchannel Plates: A new photon detector with 10 ps timing and 15 $\mu\text{m}$ spatial resolution

*Thursday, 23 May 2024 17:10 (20 minutes)*

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  $\mu\text{m}$ , using plasma-enhanced chemical vapor deposition and etch microchannels of diameter 2  $\mu\text{m}$ , every 4.5  $\mu\text{m}$ , 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  $\mu\text{m}^2$ , offering 400000 channels on chip.

## Field

Detectors and electronics

**Primary authors:** Dr ANTOGNINI, Luca (EPFL); KONSTANTINOU, Georgios (EPFL); Dr FREY, Samira (EPFL)

**Co-authors:** Dr BALLIF, Christophe (EPFL); Dr WYRSCH, Nicolas (EPFL)

**Presenter:** KONSTANTINOU, Georgios (EPFL)

**Session Classification:** PET technologies

**Track Classification:** Fast timing