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Imaging with the invisible light

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We report on a UV photo-detector with single electron sensitivity and excellent imaging capabilities. It is based on a semitransparent CsI photocathode followed by a Gas Electron Multiplier (GEM) foil and by a large area, custom, analog, VLSI ASIC. The avalanche charge produced in a GEM hole is extracted and measured by the CMOS chip that is at the same time the pixelized charge collecting electrode and the amplifying, shaping and charge measuring front-end electronics of the Micropattern Gas Detectors (MPGD). The GEM foil and the VLSI pixel chip have matched $50\mu\text{m}$ pitch on a triangular pattern. Gas gain above 10^4 and single electron detection efficiency greater than 80% have been measured. The high granularity and low noise of the read-out plane allows to reconstruct with $4\mu\text{m}$ resolution the centroid of the single electron avalanche. This defines the intrinsic resolution of the read-out system. Thanks to this unique feature, excellent imaging capability has been demonstrated. The detector position resolution is at the moment limited by the $50\mu\text{m}$ pitch of the GEM foil. Charge multipliers with finer pitch will allow exploiting the much higher intrinsic resolution of the device.

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