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High resolution photon and neutron imaging options with MCP/Timepix event counting detectors

Event counting detectors with Microchannels Plates coupled to Timepix readouts are considered here for specific UV, soft X-ray and neutron imaging applications where the detection of individual particles enables imaging with high spatial resolution as well as imaging of dynamic processes. The possibility to detect position and time of arrival for each incoming particle enables time-resolved imaging as well as the improvement of spatial resolution well below the size of readout pixel (through the event cetroiding). Our results demonstrate that the spatial resolution of these detectors is currently limited by the size of Microchannel pore spacing (⁷6 um for photon detection, [~]12 um for neutrons) over the active area of 28x28 mm[^]2. The possibility to perform time-resolved studies of periodic processes, where various phases are imaged simultaneously in one experiment is also demonstrated with imaging frames at a microsecond level, while time tagging of individual events is possible to ns scale, and is expected to be improved to sub-ns with Timepix4 readouts. Time-resolved results from synchrotron-based experiments as well as cluster analysis with scintillator-based detectors will also be demonstrated in this talk.

Primary experiment

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