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Development of neutron detectors with solid converters and Timepix3 readout

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Increasing demand for neutron detectors and the shortage (rise of the cost) of the Helium-3, opened a new era for using solid neutron converters. Our group at the University of Bonn is developing three different types of detectors by combining solid converters with high spatial and time resolution of a Timepix3-based readout. They are all thermal neutron sensitive.

One of the detectors is based on a neutron-sensitive Micro Channel Plate (MCP). It is ideal for time-resolved imaging applications. The MCP, which also acts as an amplification stage, is Boron and Gadolinium enriched. Four Timepix3 ASICs are employed for reading out the signal.

The other two detectors are gaseous detectors that aim for event-by-event high-precision measurements of space and time of the conversion point. Both detectors use boron-rich conversion layers. One is based on the Time Projection Chamber (TPC) principle with a GridPix readout for high-precision measurement, while the other is a multi-layer GEM-based detector, ideal for high rates.

In this talk, the working principles and development stages of these three detectors with state-in-art readout electronics will be presented.

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