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Qualification of DIRICH readout chain

Qualification of DIRICH readout chain *for the CBM RICH- and TRB collaborations.*

DIRICH is a multi-channel FPGA based TDC readout chain aiming for excellent timing precision in single photo-electron measurement applications. It was originally developed for the readout of Multianode Photomultipliers (MAPMT) in the HADES- and CBM RICH detectors at GSI/FAIR, but is also foreseen to be used e.g. in the PANDA experiment at FAIR. High collision rate experiments like CBM will produce high photon rates in their RICH detectors; for CBM, single photon rates up to ~ 500 kHz in each pixel of its 8×8 pixel Multianode photo multiplier tubes are expected in certain regions of the photon detectors.

A dedicated lab setup producing realistic detector signals, by using a pulsed picosecond laser light source in combination with a LED, was set up in order to validate the high rate capability of the DIRICH readout. It could be shown that individual readout channels can withstand photon rates up to 2.2 MHz/pixel, limited only by maximum data rate capability and buffer size on the frontend board.

In addition, also effects of high photon occupancy on the MAPMTs were investigated, which might cause additional signals due to capacitive cross talk within the MAPMT or readout chain. Occupancies of up to 55 % (simultaneous photon hits on more than half of the MAPMT pixels) were investigated, indicating that in the expected occupancy range of 10–15 % the readout works flawlessly with very low crosstalk.

The talk will focus on the laboratory test setup and qualification measurements of the readout chain obtained herewith.

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