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Development of a Micromegas prototype for the AMBER experiment at CERN

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Will be present the ongoing work on the development and testing of a prototype of a Micromegas (MM) detector and its front end that are intended to be a candidate for the substitutions of some of the Multi Wire Proportional Chambers (MWPC) in the future AMBER (NA66) experiment at CERN.

Presently the MWPCs are used in the COMPASS (NA58) experiment at CERN as one of the main trackers and it is planned that they will be still operated in the recently approved AMBER program. Unfortunately, due to aging of some of the structural elements of the MWPC chambers only a part of them could be operated for the whole expected life span of the AMBER program. Our main candidate technology to substitute the most aged MWPCs is the presently well-established Micro-Pattern Gaseous Detectors (MPGD). The main challenges we need to address are the operation in a fixed target environment that led to a difference of the particle rate from 120 kHz/mm^2 at the centre to a few kHz/cm^2 on the periphery of the detector, the size of the active area that should be of the order of $1 \times 1.2 \text{ m}^2$ and the necessity to maintain a reasonable material budget. To those requirements on the detector itself, we need to add the necessity to operate the detector in the new AMBER triggerless DAQ that require a specific ASIC. We are now qualifying the TIGER (Turin Integrated Gem Electronics for Readout) custom front-end ASIC as a possible candidate for the readout. Moreover during 2022 we will submit a new custom ASIC that is being designed at INFN Torino specifically for application with MM detectors in AMBER conditions. The new custom designed 64ch ASIC will provide a time and charge measurement featuring a fully digital output and operated in triggerless mode.

Collaboration

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