Status of luminosity detector for NICA MPD

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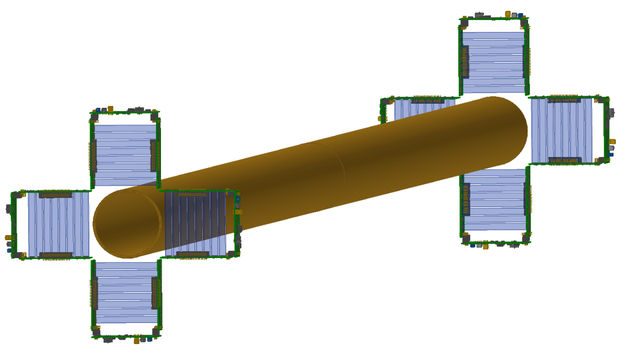
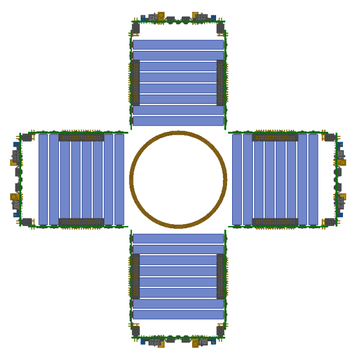
Abstract

The first stage of NICA collider operation is adjusting the convergence of beams at the point of interaction of the MPD and luminosity measurement [1]. For this purpose a simple and reliable detector based on a very common combination of scintillator and silicon photo multiplier (SiPM) was proposed. Detector consists of two planes located symmetrically relative to the interaction point. This arrangement allows us to determine the interaction point by time of flight measurement, separate of the residual gas scattering events and calibrate the luminosity by van der Meer scan [2]. Now the luminosity detector (BMO) is under production.

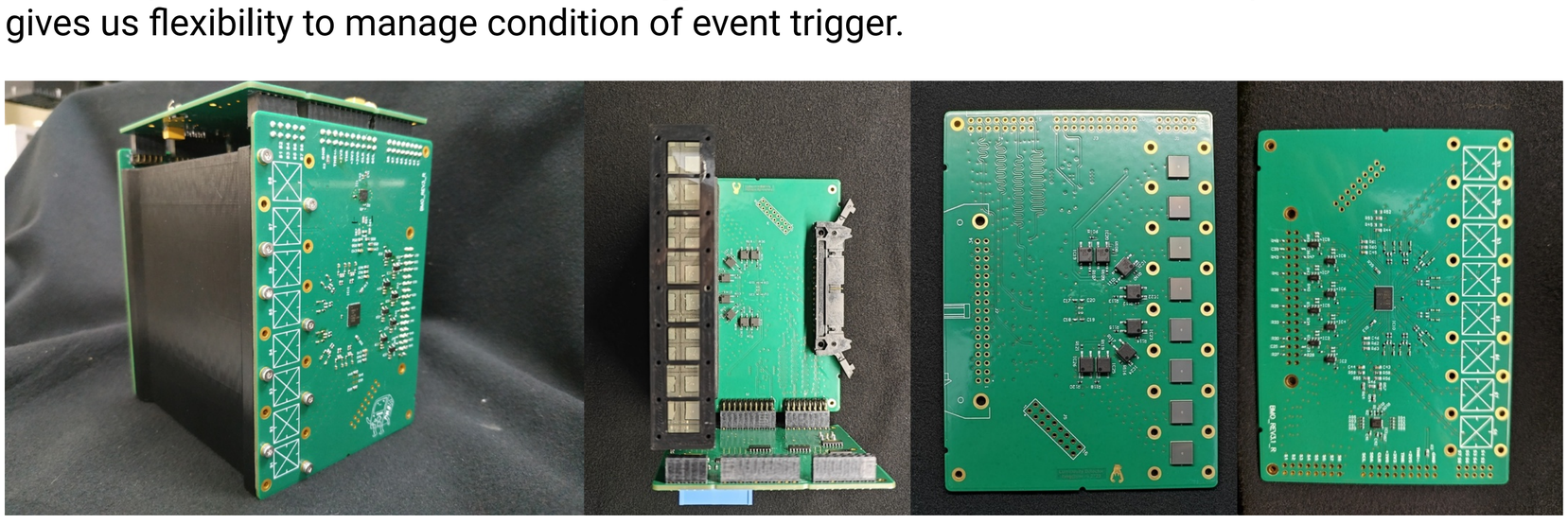
1 Introduction

BMO consist of two planes arranged by 3 meters from interaction point. Each plane takes data from 4 modules, which is 8 scintillator bars with SiPMs on the edges.



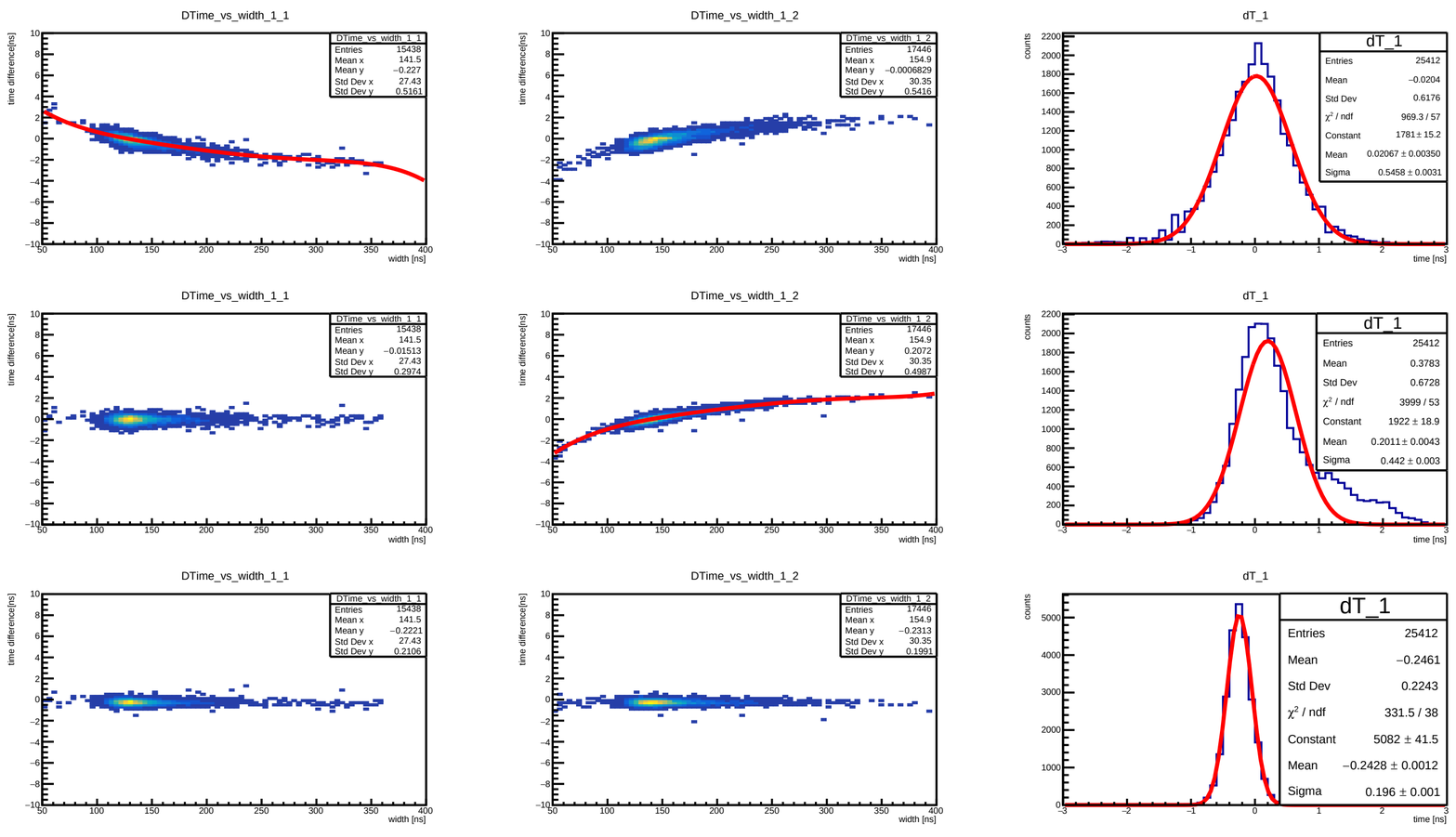


Front end electronics (FEE) are based on NINO ASIC [3]. Signal from individual SiPM is taken from anode and cathode pin (some kind of differential readout). Than it reduced by RC filter because of current limit of NINO. If reduced signal is above threshold NINO convert signal to LVDS standard. TDC64VLE from AFI Electronics [4] used for data acquisition. It based on HPTDC [5] with 100 ps bin size. BMO module has trigger unit with condition: at least one particle detected. It gives us flexibility to manage condition of event trigger.



2 Results

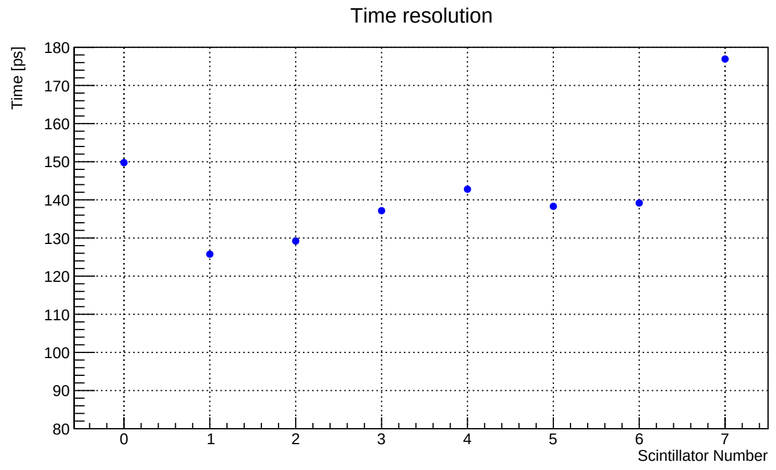
BMO module was tested on T9 PS CERN [6]. It was used as trigger and time reference for prototype of ALICE PHOS [7] calorimeter. During this test BMO worked at wide range of particle energy (from 0.5 GeV to 10 GeV). All systems worked as predicted.



Time resolution was achieved from distribution of time difference between two bars of scintillators. Time was taken as average time from left and right SiPM.

Beam setup

- Electron beam with energy range from 0.25 GeV to 10 GeV
- Beam diameter 5 *mm*
- Beam particles pass through all scintillator bars



Status

Two modules with NINO ASIC FEE are ready for beam test at Department of High Energy Physics (S-25R) . Remaining modules are under production and will be ready by march 2024. Software for information exchange between luminosity group and accelerator team is under development.

Achievements

- Time resolution $< 200ps$
- Efficiency $\sim 99\%$

3 Contacts

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References

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