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Test of full PSD readout chain at the mCBM

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The forward hadron calorimeter (PSD – Projectile Spectator Detector will be used at the Compressed Baryonic Matter (CBM) experiment at FAIR to measure the nucleus-nucleus collision centrality and orientation of the reaction plane. The PSD is a sampling lead/scintillator with modular transverse structure and longitudinal segmentation. The PSD has 46 modules with 10 longitudinal sections in each module. Light readout from each section is provided by Hamamatsu MPPC installed at the rare side of modules.
The PSD FEE and readout system is based on the ADC FPGA board, which was originally designed for ECAL at PANDA. This board employs two Kintex-7 FPGAs, which are processing the incoming data from ADCs with 14-bit resolution and 125MHz digitization rate for 32 channels per one FPGA. Due to high radiation doses and neutron fluences expected at the CBM, PSD readout electronics will be placed in the radiation protected room. Boards with photodetectors (MPPCs) will be placed on the back plane of the PSD without preamplifiers and will be connected with 60m coaxial cable with readout electronics placed outside of the cave.
The developed data acquisition system registers signals from 2.5 mV to 1.5 V, which provides coverage of the dynamic range x500 when adjusting the voltage corresponding to photodetectors for temperature correction of their gain. Direct digitization of low amplitude signals without the use of active electronics on the detector side is a new approach for the detector's readout system in nuclear physics, which makes it possible to realize the maximum possible dynamic range of the detector.
The full chain of the FEE and readout electronics of one PSD module - "mini PSD" (mPSD) has been assembled at mCBM. The readout has been integrated into mCBM trigger-less data acquisition system. Details of the PSD readout electronics, signal processing and transmission within the common synchronized mCBM data transport system will be shown.

The speaker is a student or young scientist

No

Section

1. Intermediate and high energies, heavy ion collisions

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