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Electronics for the Time-of-Flight Systems

A conceptual design of the MultiPurpose Detector (MPD) is proposed for a study of hot and dense baryonic matter in collisions of heavy ions. The MPD experiment is foreseen to be carried out at a future JINR accelerator complex facility for heavy ions –the Nuclotron-based Ion Collider fAcility (NICA).

Ambitious physics goals of MPD require excellent particle identification capability over as large as possible phase space volume. Charged particles in a large momentum range are identified in the MPD by the Time of Flight (TOF) detector. Overall time resolution should be better than 100 ps. For the TOF system of the MPD the Multigap Resistive Plate Chambers (MRPC) with a strip readout are used.

Very important part of the high performance of the TOF system is a readout electronics. For the full exploitation of the excellent timing properties of the Multigap Resistive Plate Chamber, front-end-electronics (FEE) with special characteristics are needed. The signals from the MRPCs must be amplified and discriminated as fast as possible without lossless. A signal is read from two sides of the strip, which makes problems like a compatibility the FEE .

A NINO application-specific integrated circuit (ASIC) has been decided as a base of front-end-electronics. The NINO ASIC developed by the CERN LAA project, which combines a fast amplifier, discriminator and stretcher. FEE board based on the NINO ASIC. Designed in the Laboratory for High Energy Physics (LHEP) for compatibility used in the TOF-MPD MRPC.

According to the results of bench tests preamplifier board showed a stable work and good time resolution >10 ps. Also tested with the detector beam of the Nuclotron and achieved time resolution of the system Electronics with Detector ~ 55 ps.

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