

R-I. “Lendület” innovative particle detector development



“Momentum” research team

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The Detector Physics Research Group has undergone considerable restructuring during the summer of 2013, and this is apparent both in the change of the name, and in the shift of the research objectives. During the first half of the year the gravity has been on the consolidation of the results, whereas starting from 15th July, owing to the successfully achieved “Momentum” support from the Hungarian Academy of Sciences, the developments towards more ambitious perspectives have been undertaken.

The key research projects were the following:

- High position resolution, single UV photon scanning system for microstructure gaseous detectors. The system has been developed with the aim of optimization of UV sensitive gaseous detectors. We have obtained the financial support of the CERN RD51 Collaboration for the project (Common Funded Project), and during the year we have built the final prototype.
- Cosmic muon detection for geophysical applications. The Muon Tomograph detector system, built by our group, has been applied for underground measurements at various locations, demonstrating the applicability of the device for soil density measurements. The detector has also been applied to measure cosmic muon background: the angular dependence of the muons, reaching underground to the proposed low-background site in Felsenkeller (Germany) was evaluated.
- Innovative gaseous detector development. We have successfully combined the Thick GEM technology with multi-wire proportional chambers, and proved its applicability for high efficiency Cherenkov radiation detection.
- In the framework of the NA61 Collaboration, we have concentrated on proton-nucleus interactions. In such collision systems the determination of event centrality plays a key role, however this is particularly problematic due to the few number of produced particles. We have earlier built a detector (the LMPD) for the NA61 experiment, which addresses specifically the characterization of event centrality via counting of low momentum protons. This device has been operated in physics data taking of the NA61 proton-lead runs. We have prepared a technical paper on the working principle and commissioning of the pertinent detector.
- The experts of our DAQ team continued to provide software, firmware and hardware support for the operation and continuous development of the Detector Data Link (DDL) system of the ALICE experiment. During the ongoing first long shut-down in 2013-14, the Read-out Receiver Cards (RORC) of several subdetectors will be replaced by a new, much higher performance custom FPGA card, the C-RORC, which will serve as a new common read-out card for the Data Acquisition (DAQ) and the High-Level Trigger Farm (HLT). The integration of this new hardware into the ALICE software environment is completed. The Wigner RCP is the responsible institute of

the development of the new Common Read-out Units (CRU) that will be a central element of the new, upgraded read-out system.

The tasks of the newly established “Momentum” research group for the first year include the realization of an internationally competitive lab framework for the development of gaseous detectors. We have refurbished practically all the available laboratory spaces, including two new sites as well. The completed critical infrastructures are the following:

- Gas distribution system, for precision mixing of various high purity gases
- Clean compartment, optimized for microstructure and traditional gaseous detector handling, construction, and maintenance

Grants and international cooperation

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“Momentum” Program of the HAS

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See also: R-H.1

NA61/SHINE Collaboration

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