
R-G. PARTICLE DETECTOR RESEARCH AND DEVELOPMENT

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Our task is to study and develop advanced micropattern gas-avalanche detector technologies for applications in and outside high energy physics in close collaboration with the Lorand Eötvös University, including frontend and data acquisition electronics and software.

In 2012 the work was concentrated on further improvement of the detectors and technologies, which has been started during the past three years:

VUV-photon detector for the ALICE-VHMPID upgrade project. —A 200x200 mm² prototype detector based on CsI-covered ThickGEM (Fig. 1) has been tested at CERN with 6 GeV pions, and a full Cherenkov ring could be seen for the first time with GEM-type detector (Fig. 2).

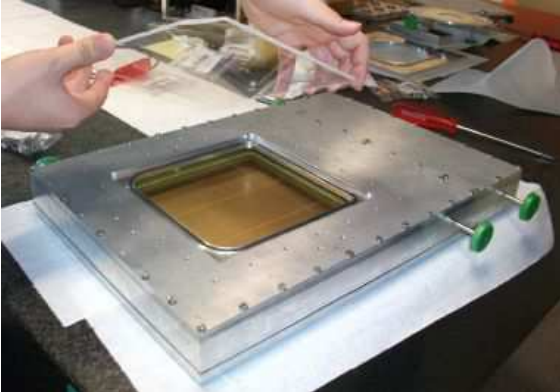


Fig. 1: ThickGEM-based photon detector during assembly

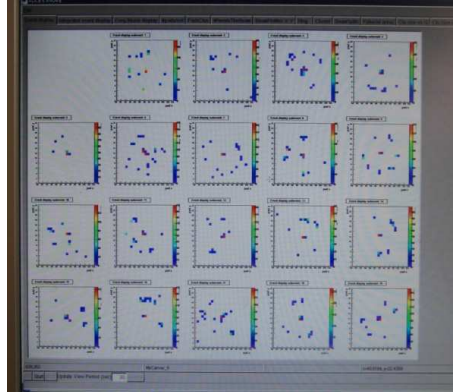


Fig. 2: Some detected Cherenkov ring events

A new and very perspective method has been developed for characterization of the TGEM-based detectors by scanning and extracting photo-electrons from the surface with focused UVlight (Fig. 3).

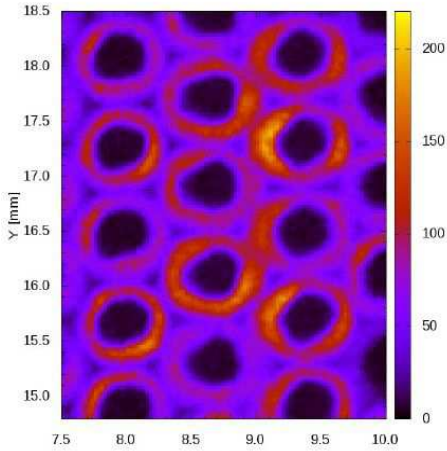


Fig.3: Efficiency-map of the ThickGEM detector surface



Fig. 4: Large-size CCC-chamber

Further development of the CCC (Close Cathode Chamber) technology and its application for muon tomography. — We have proposed and developed a light-weight low-cost chamber which can be built in large size (Fig.4). The design has been accepted as the candidate for the particle-track detector of the VHMPID. A small prototype (Fig. 5) was already used during the VHMPID beam tests at CERN.



Fig. 5: CCC-chamber used during the VHMPID-beamtests at CERN



Fig. 6: The portable Muon Tomograph in the Ajándék-cave

The improved version of the Muon Tomograph based on CCC-chambers has been applied in different caves in Hungary and measured the relief and possible cavities by detecting cosmic muons. The particularity of this device is its portability and autonomy during data taking (Fig.6).

GRANTS AND INTERNATIONAL COOPERATION:

OTKA-NKTH CK77815 (György Bencze, 2009-2013)

CERN CMS collaboration (Gy. Bencze)

CERN RD51 collaboration, (Gy. Bencze Wigner group leader, G. Hamar, L. Kovács, E. Dénes)

CERN NA61 collaboration (T. Tölyhi)

CERN ALICE collaboration (Gy. Bencédi, G. Hamar, E. Dénes, T. Kiss)

CERN ALICE VHMPID upgrade project (Gy. Bencze, Gy. Bencédi, G. Hamar, E. Dénes)

PUBLICATIONS

Articles

1. Hamar G, Varga^{*} D; High resolution surface scanning of thick-GEM for single photoelectron detection; *Nucl Inst and Meth A*; **694**, 16-23, 2012
2. Hamar G, Lévai P; Strange and nonstrange hadron resonance production by quark coalescence, investigating quark number scaling; *Acta Phys Polon*; Suppl 5; 451-456, 2012
3. Varga^{*} D, Kiss^{*} G, Hamar, G, Bencédi Gy; Close cathode chamber: low material budget MWPC; *Nucl Inst and Meth*; **698**, 11-18, 2012
4. Arce^{*} P, et al.; CMS structural equilibrium at constant magnetic field as observed by the link alignment system; *Nucl Instrum Meth*; **A675**, 84-96, 2012

See also: R-B.I., R-F (Alice, NA61)