A New Experimental System for Electron Transverse Diffusion Measurements

A.M.F. Trindade[a,b], J. Escada[a,b], J.M. Maia[a,c], R.M. Curado da Silva[a,b] and F.P. Santos[a,b,*]

* Corresponding autor: filomena.santos@coimbra.lip.pt

[a] LIP – Laboratório e Física Experimental de Partículas, [b] Departamento de Física da Universidade de Coimbra, [c] Departamento de Física, Universidade da Beira Interior

In the large size ongoing experiments for particle physics and rare event experiments new gas media are being used or sought. One of the key features required for these media is low electron transverse diffusion, to achieve good tracking accuracy that will enable the most needed background rejection. The properties of these new mixtures are mostly unknown and assessing them beforehand is paramount.

We present a new device designed to measure electron transverse diffusion in a gas medium. The device is composed of a Xe lamp and a measuring chamber separated by a quartz window. In the chamber side of the window, where a transmissive CsI photocathode was deposited, photoelectrons produced by the lamp are guided through a drift electric field to a GEM, where they are multiplied, before being collected in a flange - an insulating substract, where metal strips are deposited and duly biased, located at a fixed distance (0.5 mm) from the GEM. The flange is mounted on a precision motion feedthrough that enables to set the variable drift distance, between 3.78 and 60 mm. The charge is collected in each strip with an electrometer, at several drift distances.

Results for transverse diffusion coefficients are obtained from charge distributions for the different drift distances, taken at each setup settings. Preliminary results have already been obtained in pure Xe and CH_4 - two gases with different electron drift properties – and are in good agreement with available data.