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Tests of eco-friendly gas mixtures in GEM based detectors with optical readout

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Abstract
Modern imaging detectors can exploit the scintillation light produced in MPGDs during electron avalanche multiplication. Using gas mixtures with scintillation light spectra compatible with the quantum efficiency of CCD or CMOS cameras, an optical readout can be implemented and a 2-dimensional image of the track can be reconstructed. In The Cygno project, a TPC for directional dark matter searches and neutrino scattering measurements, a three GEM layers detector is used as amplification device and the light produced during the multiplication process is detected by a sCMOS camera. The TPC is operated with a mixture of Helium and CF4. Recently the European community has banned many freon gases because of their high pollution impact to the atmosphere. Our group has started a study to test eco-friendly gases to replace the CF4 in such kind of applications. The setup used to collect data and preliminary results obtained in terms of amplification factors and of light production will be presented by using some of the more interesting ecological gas mixtures selected on the market.

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