

Characterization of Mixtures of Noble Gases with Molecular Additives for Radiation Detection



LABORATÓRIO DE INSTRUMENTAÇÃO
E FÍSICA EXPERIMENTAL DE PARTÍCULAS

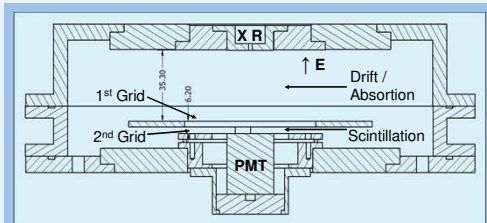
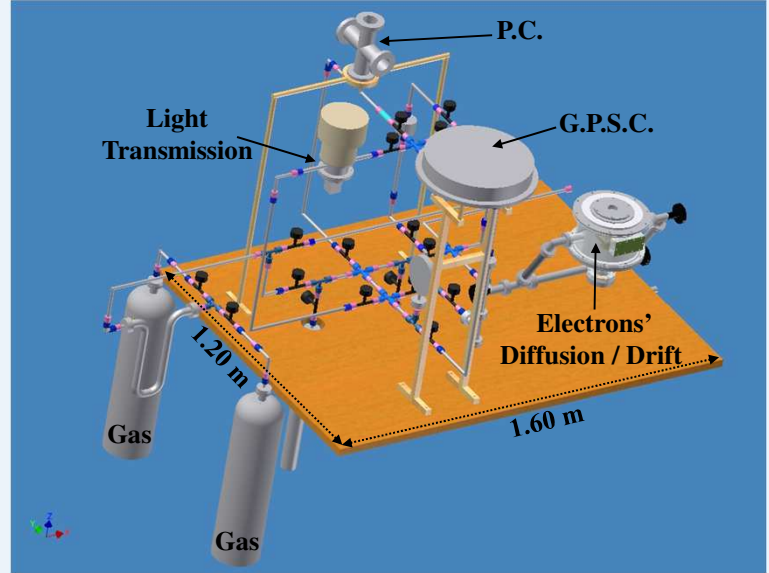
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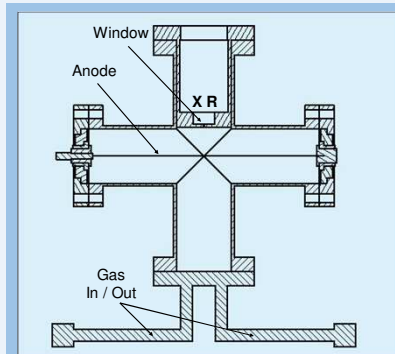
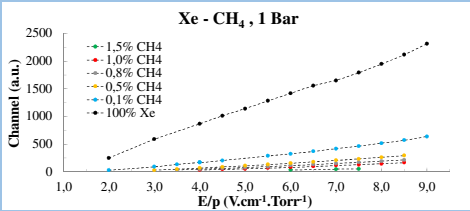


Abstract: In gaseous detectors, the detection medium can change substantially their characteristics. It was our plan to study rare gas-based gas mixtures with molecular gases considered potentially interesting in international experiments in which the group is involved: NEXT (Neutrino Experiment with a Xenon TPC) and IXPE (X-ray Imaging Polarimetry Explorer). To achieve our goal, an experimental setup was built which includes: A Proportional Counter; A Gas Proportional Scintillation Counter; A device to determine the positive ion mobility in the parent gas; An apparatus to determine the VUV light absorption; A device to study electron mobility and diffusion parameters.



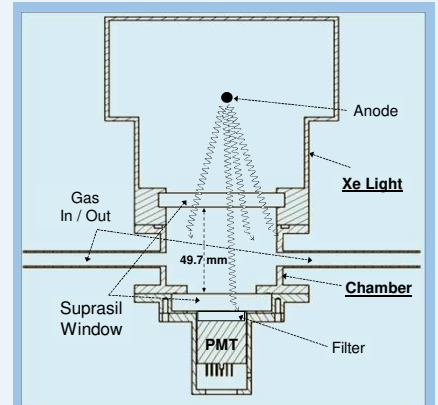
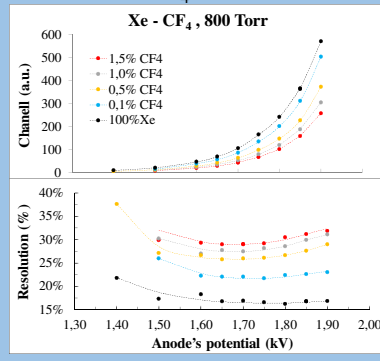
Gaseous Proportional Scintillation Counter

Results in light with
Xe-CH₄ mixtures



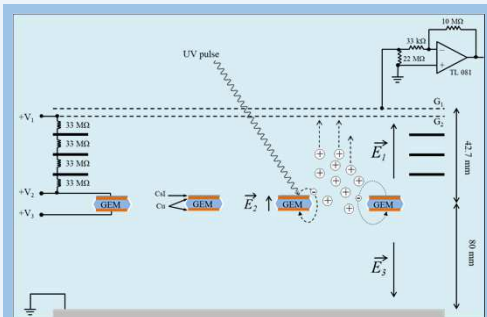
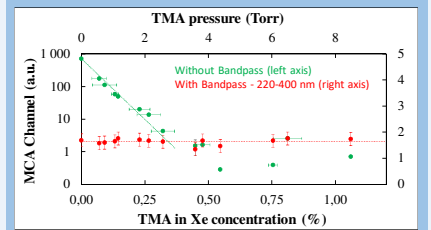
Proportional Counter

Results in charge with
Xe-CF₄ mixtures



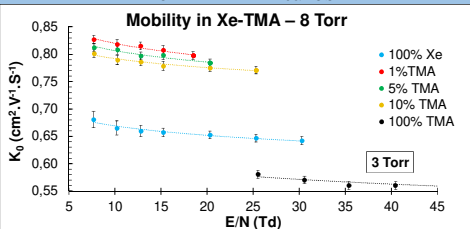
Schematic representation of the
experimental setup to light studies

Results in Xe-TMA mixtures.

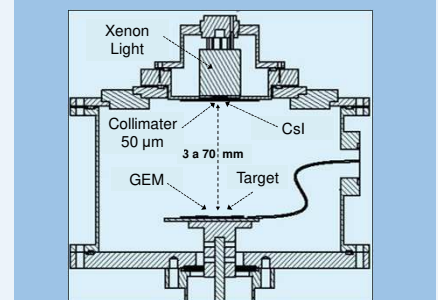


Schematic representation of the physical
processes to study ions' mobilities

Reduced ion mobility K_0 in
Xe-TMA mixtures



Conclusions: This experimental setup allows us study the different characteristics of gaseous mixtures independently, ensuring the use of same gas mixture in all devices. Results were obtained in pure Xe and mixtures of Xe with CH₄, CF₄ and TMA, which resulted in two articles in international journals and four more are expected to be submitted soon.



Schematic representation of the
experimental setup to study electron
diffusion coefficients in gas mixtures