

NITEC: a Negative Ion Time Expansion Chamber for very rare event search

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We will present an R&D project for the realization of an original and innovative detector for directional Dark Matter searches, that will combine the advantages of a Negative Ions Time Projection Chamber (NITPC) with the benefits of triple GEM amplification and pixelated readout (GEMPix). In a NITPC, negative ions drift rather than free electrons, drastically reducing diffusion thanks to their higher mass. This is why we want to combine for the first time this concept with one of the most advanced readout: the GEMPix, a triple GEM detector coupled to a Medipix ASIC board, able to provide excellent spatial, energy and time resolutions, developed by LNF. Its sensitivity to single ionization cluster could allow the NITPC, together with the slow motion of the anions, to function effectively as a Time Expansion Chamber, hence NITEC, providing improved position and energy resolution. We will present preliminary measurements of NITEC performances with common electron-drift gas mixtures (Ar:CO₂ and Ar:CO₂:CF₄) and the first negative ion operation with SF₆ (Ar:CO₂:SF₆ mixture).

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