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Zero Ion Backflow detector operating in pure xenon

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One of the challenges of modern Time Projection Chambers (TPC) is to prevent the re-injection of the secondary ions produced on the gas amplification layer into the sensitive volume of the detector. Particularly in high multiplicity TPC the presence of positive ions has the potential to affect the tracking properties of the detector due to space charge effects.
The use of the secondary scintillation emitted by noble gases and CF4 is an alternative to the readout of TPC since no secondary ionization occurs and hence the ion feedback is naturally reduced to the level of primary ionization.
The Zero Ion Back Flow (Zero IBF) detector is the combination of a gaseous scintillation proportional counter (GSPC) with a gaseous photomultiplier (GPM) and presents full ion backflow suppression. The GSPC is composed by 3 parallel grids that define the conversion and the scintillation regions of the detector. The primary electrons produced in the conversion region are transferred to the scintillation region were they are accelerated by an electric field with an intensity above the threshold for scintillation but below the one for ionization. A fraction of the secondary scintillation emitted by the atoms of the gas is collected by the GPM that in the current setup is composed by a CsI photocathode coupled to a double GEM detector, although other gaseous electron multipliers, e.g. THGEM and MHSP, are considered.
The number of photo-electrons extracted from the CsI photocathode per each primary electron, defined in previous works as the optical gain, is of critical relevance for the efficient operation of the Zero IBF detector. In this work we present the results achieved with the Zero IBF detector operating in pure Xenon.

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