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# Lowering the background level and the energy threshold of Micromegas x-ray detectors for axion searches

Axion helioscopes search for solar axions by their conversion in x-rays in the presence of high magnetic fields. The use of low background x-ray detectors is an essential component contributing to the sensitivity of these searches. In this work, we review the recent advances on Micromegas detectors used in the CERN Axion Solar Telescope (CAST) and proposed for the future International Axion Observatory (IAXO). The actual setup in CAST has achieved background levels below 10-6 keV-1 cm-2 s-1, a factor 100 lower than the first generation of Micromegas detectors. This reduction is based on active and passive shielding techniques, the selection of radiopure materials and offline discrimination techniques, thanks to the high granularity of the readout. We will describe in detail the background model of the detector, which is based on its operation at CAST site and at the Canfranc Underground Laboratory (LSC), as well as on Geant4 simulations. The best levels currently achieved at LSC are as low as 10-7 keV-1 cm-2 s-1, showing good prospects for the application of this technology in IAXO. Finally, we will present the R&D for reducing the energy threshold of these detectors below 1 keV, using high-transparent windows, autotrigger electronics and studying the cluster shape at different energies. As a high flux of axion-like-particles is expected in this energy range, a sub-keV threshold detector could enlarge the physics case of axion helioscopes.

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