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## Micromegas X-ray detectors for (Baby)IAXO

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Axions and axion-like particles (ALPs) are well-motivated candidates to solve both the strong CP problem and the dark matter puzzle. One of the most promising experimental strategies to detect them is the axion helioscope, which searches for solar axions through their conversion into X-ray photons in a strong magnetic field. The International Axion Observatory (IAXO) is conceived as the next-generation helioscope, aiming for a sensitivity improvement of more than an order of magnitude compared to CAST, the most sensitive helioscope to date. BabyIAXO, currently under construction at DESY, will act as a demonstrator for the key technologies required by IAXO, while already providing competitive physics reach.

A key requirement for the BabyIAXO helioscope is achieving ultra-low background levels —below  $10^{-7}$  counts/keV/cm<sup>2</sup>/s— while maintaining high detection efficiency in the Region of Interest. Meeting these requirements involves the development of highly sensitive and radiopure X-ray detectors. The baseline detection technology, a gaseous TPC with Micromegas readout plane, is being optimized through a set of complementary prototypes. At surface level, detectors operating in Zaragoza and at CEA-Saclay (recently moved to DESY) are focused on understanding and mitigating the impact of cosmic backgrounds, including dedicated studies with shielding and active muon veto systems. In parallel, a third prototype is operated at the Canfranc Underground Laboratory. This underground setup provides a unique environment to characterize the intrinsic performance and background contributions of the detectors.

This talk will present the IAXO project and the current status of the IAXO-D1 prototypes, including preliminary results of background characterization.

### Abstract

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