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Performance of Micromegas detector in CAST experiment

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A micropattern gaseous detector has been designed for the CERN Axion Search experiment CAST, based on the Micromegas technology. The twodimensional readout, with XY strip structure, allows for sufficient spatial sensitivity and the low natural radioactivity materials used for its construction meet the experiment demands for low background. The detector is operated with an Argon/Isobutane (95% 5%) mixture and is controlled by a VME data acquisition system. It is optimized for soft Xrays (110keV) detection, exhibiting linear response and good energy resolution (19% FWHM at 5.9 keV). The Micromegas detector operated efficiently during the 2003 and 2004 data taking periods of CAST and its upgrade for the 2004 run, supported by the development of sophisticated software analysis tools, improved the background rejection leading to a rate of about 5.105 events/keV/cm²/s with 92% efficiency. Detailed Monte Carlo studies, using the GEANT4 package, indicate that the measured background is induced by muons hitting the surrounding materials as well as neutrons from the experimental site and environmental radioactivity (Radon).

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