

VOXES, a graphite mosaic crystal based Von Hamos spectrometer for extended and diffused sources

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Bragg spectroscopy is a consolidated experimental method for high-energy resolution X-ray measurements. However, this technique is limited to the detection of photons produced from point-like or well collimated sources and becomes quite inefficient for photons generated in extended and diffused ones. Also, the possibility to perform simultaneous measurements of several X-ray lines is of great benefit when low-rate signals are expected and individual angular scans require long exposure times.

We present a prototype of a high-resolution X-ray spectrometer based on Highly Annealed Pyrolytic Graphite (HAPG) mosaic crystals, developed by the VOXES (high resolution VOn hamos X-ray spectrometer using HAPG for extended sources) collaboration at INFN Laboratories of Frascati, able to work with extended (millimetric) and isotropic sources. The spectrometer has been tested in the energy range 6–19 keV, to deliver a cost-effective system having an energy resolution (FWHM) at the level of a few eV, able to perform sub-eV precision measurements of single and multielement targets in a broad energy range.

In this talk, the working principle of the VOXES spectrometer is presented, including a detailed description of the geometry, the calibration methods and the spectral fitting functions. Results of X-ray tracing simulations are compared to the experiment.

The proposed spectrometer has possible applications in several fields, going from fundamental physics, synchrotron radiation and X-FEL applications, medicine and industry to hadronic physics experiments, where its performances make it a fundamental tool for a series of measurements like the energies of kaonic atoms transitions, allowing to extract fundamental parameters in the low energy QCD in the strangeness sector.

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