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Characterization of a High Resolution Von Hamos Spectrometer with HAPG Crystals for Extended Sources; a New Opportunity for High Precision Nuclear Physics Measurements

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Bragg spectroscopy is one of the best established experimental methods for high energy resolution X-ray measurements; however, this technique is limited to the measurement of photons produced from well collimated or point-like sources (tens of microns) and becomes quite inefficient for photons coming from extended and diffused sources.
The VOXES project's goal is to realise a prototype of a high resolution and high precision X-ray spectrometer, using Highly Annealed Pyrolitic Graphite (HAPG) crystals in the Von Hamos configuration, working also with extended isotropic sources.
The aim is to deliver a cost effective system having an energy resolution at the level of eV for X-ray energies from about 2 keV up to tens of keV, able to perform sub-eV precision measurements with non point-like sources.
The proposed spectrometer has possible applications in several fields, going from fundamental physics to quantum mechanics tests, synchrotron radiation and X-FEL applications, astronomy, medicine and industry.
In particular, these technique is fundamental for a series of nuclear physics measurements like, for example, the energy of the exotic atoms radiative transitions which would allow to extract fundamental parameters in the low energy QCD in the strangeness sector.
Here, the working principle and the characterization of the spectrometer will be presented, together with the preliminary results on the pionic carbon 4f $\longrightarrow$ 3d and 4d $\longrightarrow$ 3p transition lines measurment performed at the Paul Scherrer Institute (PSI).

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