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Development of GEM-based detector system for plasma diagnostics application

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The proposed work refers to the development of gaseous detectors for application at tokamak plasma radiation monitoring. Such a diagnostics is of high importance for future and current fusion reactors as measurement of Soft X-ray Radiation (SXR) in 0.1-20 keV photon energy range accesses a valuable information on particle transport and magnetic configuration of magnetic fusion plasmas. A successful monitoring system should be able to discriminate energy of the incident absorbed photons and to have good spatial resolution (i.e., localization of their position on the detector readout pads) while operating in the required region. Nevertheless, as of today many physical, technical and technological aspects are still needed to be taken into consideration in order to develop the photon conversion and signal processing part of such monitoring system.
The work will cover the experience in developing Gas Electron Multiplier (GEM) detectors for different plasma fusion facilities and the results of previously designed detecting systems will be presented. Different geometries of the detecting chamber as well as data acquisition and processing electronics were elaborated in order to study X-ray emission of extremely intense plasma radiation in SXR region. It will also highlight the latest conceptual design and preparation of GEM based SXR detecting system for plasma impurities tomography, which is under development by our group. The information gathered from the metal impurities monitoring is especially crucial for future ITER-like machines. The experience in the elaborating of plasma imaging technology and the results of preliminary tests will be also shown.
The work will present main elaborations of research and development phases together with the results of experiments. The gathered experience of many years could be applied for the development of gaseous detectors aimed at different applications.

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