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10.5 2D GEM based imaging detector development from perspective of high intensity soft X-ray plasma radiation

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The proposed work is devoted to design, construction and testing advanced imaging diagnostics that will be able to perform the global SXR imaging ultimately aimed at both high Z and light impurities tracking. The detection structure is based on triple GEM amplification structure followed by the pixel readout electrode. The efficiency of detecting unit was adjusted for the radiation region of tungsten in high-temperature plasma. It provides 2D imaging with high time resolution (sub millisecond), high sensitivity and signal to noise ratio, good energy discrimination, with ability to address and programme single pixels.This work will present the detector characteristics and preliminary laboratory results obtained for the developed system. The operational characteristics and conditions of the detector were designed to work in the X-Ray range of 2–17 keV. Stream-handling data acquisition mode was developed for the detecting system with timing down to the ADC sampling frequency rate (˜13 ns). The spatial resolution and imaging properties of this detector were studied for conditions of high counting rates and high gain. Imaging capabilities of GEM detectors were tested with different patterned anode planes (i.e. different readouts) to verify the detector high rate capability.

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