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On preliminary considerations towards development of radiated power and SXR diagnostics for DEMO

M. Chernyshova, K. Malinowski, S. Jabłoński, T. Fornal, K. Mikszuta-Michalik, T. Czarski, K. Tomaszewski

Institute of Plasma Physics and Laser Microfusion, Hery 23, 01-497 Warsaw, Poland

maryna.chernyshova@ipplm.pl

Currently, a new X-ray detection technology is required for tokamaks such as ITER or DEMO, since conventional X-ray detectors that are being used nowadays in existing equipment may rapidly degrade due to harsh fusion reactor environment. Processes that occur during the interaction of radiation with matter in fusion facilities obligate for materials that are used in such facilities to have an excellent radiative stability. That obligation is imposed not only on the wall materials but on other materials that are constituents of, e.g., detectors, and it constantly cultivates the search for new technologies in the field of plasma diagnostics.
This work addresses such a particular task as creation of a new diagnostics for radiated power and soft X-ray core intensity measurements that will be useful for future thermonuclear reactors and will be able to provide reliable plasma control (monitoring the power loss across the separatrix) in accordance with the DEMO control requirements. It could be also supportive in studying heavy impurity profiles, MHD modes and localization, plasma positioning and shape.
Gas Electron Multiplier (GEM) technology is chosen to be the base for such a new SXR detection system. This technology's main advantages include compactness of GEM detector, good temporal and spatial resolution, availability of energy discrimination of the incident photons, better neutron resilience than the existing systems. All of these make it potentially a good candidate for SXR measurement in ITER and DEMO.
This contribution will present the results of the preliminary work on the conceptual design of the DEMO Prad/SXR diagnostics based on EU-DEMO Physics Baseline 2018 parameters [M. Siccinio et al., Fus. Eng. Design 156 (2020) 111603]. The overall activity is targeted at the detailed diagnostics design, engineering and integration studies, including investigation of the feasibility, performance of diagnostics and its components. The details on the preliminary considerations on the above will be provided.

Primary authors: CHERNYSHOVA, Maryna (Institute of Plasma Physics and Laser Microfusion); MALINOWSKI, Karol (Institute of Plasma Physics and Laser Microfusion); JABLONSKI, Slawomir (Institute of Plasma Physics and Laser Microfusion); Mr FORNAL, Tomasz (IPPLM); MIKSZUTA-MICHALIK, Katarzyna (IPPLM); CZARSKI, Tomasz (Institute of Plasma Physics and Laser Microfusion); TOMASZEWSKI, Krzysztof (IPPLM)

Presenter: CHERNYSHOVA, Maryna (Institute of Plasma Physics and Laser Microfusion)