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X-ray radiation transport in GPU accelerated Particle In Cell simulations

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Ultra-high-intensity laser pulse interactions with solid density targets are of central importance for modern accelerator physics, Inertial Confinement Fusion(ICF) and astrophysics.

In order to meet the requirements of real-world applications, a deeper understanding of the underlying plasma dynamics, including plasma instabilities and acceleration mechanisms, is needed.

Due to high electron density, the over-dense target bulk is impenetrable to probes in the optical range. Hence, several X-ray diagnostics, such as small-angle X-ray scattering (SAXS) and X-ray polarimetry, were proposed by the community.

Therefore, we bring a Monte Carlo based X-ray radiation transport module into our Particle In Cell simulation framework PIConGPU. Among others, this allows for Thompson scattering, e.g. for SAXS, and Faraday effect calculation for polarimetry - as online, in-situ diagnostics.

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