## Abstract Submitted for the DPP19 Meeting of The American Physical Society

Structured targets for generation of Megatesla-level magnetic fields and their detection through Faraday rotation of XFEL beams<sup>1</sup> TOMA TONCIAN, Institute for Radiation Physics, Helmholtz-Zentrum Dresden-Rossendorf, TAO WANG, Univ of California - San Diego, MINGSHENG WEI, Laboratory for Laser Energetics, Univ of Rochester, ALEXEY AREFIEV, Univ of California - San Diego — Laser-driven Megatesla-level magnetic fields have been identified as the key feature of laser-plasma interactions that enables effective direct laser acceleration of electrons to GeV-level energies and efficient generation of directed gamma-ray beams. Experimental detection of these fields is essential. However, the combination of the unprecedented field strength and high plasma density rules out conventional optical and charged particle probing techniques. As an alternative, we have examined the feasibility of utilizing an XFEL beam as a magnetic field detection tool, based on the magnetic field inducing a polarization rotation due to the Faraday effect [Phys. Plasmas 26, 013105 (2019)]. Our PIC simulations and post-processing show that structured targets with a pre-filled channel are necessary to achieve rotations that exceed 0.1 mrad. The polarization impurity of an XFEL beam with  $5 \times 10^{12}$  photons must not exceed  $10^{-8}$ .

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