Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Extreme laser-driven magnetic fields: from generation to possible detection[1] TOMA TONCIAN, Helmholtz-Zentrum Dresden-Rossendorf, Germany, TAO WANG, OLIVER JANSEN, CHEDS, Univ. of Texas, Austin, DAVID STARK, Los Alamos National Laboratory, ALEXEY AREFIEV, University of California, San Diego — A remarkable feature of a solid density target irradiated by a high intensity laser pulse is its ability to sustain an extremely strong electron current that greatly exceeds the classical Alfvén limit. As the target becomes relativistically transparent due to the electron acceleration by the laser pulse, the current becomes volumetrically distributed. This allows for a MT-level quasi-static magnetic field to be generated in an considerable volume inside the solid density material [D. Stark, T. Toncian, and A. Arefiev, PRL 116, 185003 (2016)]. The MT-level field can be extremely beneficial for particle acceleration and gamma-ray generation. What are the exact conditions for generating a strong magnetic field? How big is the resulting magnetic field filament and for how long does it exist? Finally, how can one detect such a field? In this work, we focus on answering these questions in the context of the experimental capabilities that should soon be available at the European XFEL and explore the feasibility of the magnetic field detection inside a solid-density material using XFEL photons.

[1]This research was supported by the National Science Foundation under Grant No. 1632777. Simulations were performed with the EPOCH code using HPC resources provided by the TACC at the University of Texas.

Tao Wang
CHEDS, Univ. of Texas, Austin

Date submitted: 14 Jul 2017 Electronic form version 1.4