Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Polarized QED cascades[1] ALEC G. R. THOMAS, Univ of Michigan - Ann Arbor, DANIEL SEIPT, Helmholtz Institut Jena, Frbelstieg 3, 07743 Jena, Germany, CHRISTOPHER P. RIDGERS, York Plasma Institute, Department of Physics, University of York, York YO10 5DD, United Kingdom, DARIO DEL SORBO, High Energy Density Science Division, SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA — By taking the spin and polarization of the electrons, positrons and photons into account in the strong-field QED processes of nonlinear Compton emission and pair production, we find that the growth rate of QED cascades in ultra-intense laser fields is modified, up to 25 %. While this means that fewer particles are produced, we also found them to be highly polarized. We further find that the high-energy tail of the particle spectra is polarized opposite than that expected from Sokolov-Ternov theory, which results from "spin-straggling". We employ a kinetic equation approach for the electron, positron and photon distributions, each of them spin/polarization-resolved, with the QED effects of photon emission and pair production modelled by a spin/polarization dependent Boltzmann-type collision operator. For photon-seeded cascades, depending on the photon polarization, we find an excess or a shortage of particle production in the early stages of cascade development, which provides a controllable experimental signature.

[1]US ARO Grant no. W911NF-16-1-0044, AFOSR Grant No. FA9550-16-1-0121, NSF grant 1804463 and UK Engineering and Physical Sciences Research Council grant EP/M018156/1.

Alexander Thomas
Univ of Michigan - Ann Arbor

Date submitted: 29 Jun 2020 Electronic form version 1.4