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Laser-driven amplification of a seed magnetic field by electrons carrying OAM[1] YIN SHI, University of California, San Diego, ROBERT KINGHAM, Imperial College London, ALEXEY AREFIEV, University of California, San Diego — Creation of quasi-static magnetic fields exceeding 1 kT is challenging and their use in laser-plasma interactions is further complicated by the plasma diamagnetic response. In this talk, we show how a seed magnetic field of 100 T can nevertheless be successfully amplified by more than an order of magnitude in a laser interaction with a thin foil. The new amplification mechanism involves the motion hot electrons towards the laser axis that causes them to gain orbital angular momentum (OAM) due to the presence of the seed axial magnetic field. The resulting azimuthal current amplifies the seed magnetic field. The mechanism is demonstrated using 3D kinetic simulations for a thin foil irradiated by a 600 fs laser pulse with a peak intensity of 10^{17} W/cm^2. The simulations show that the amplified field persists for hundreds of femtosecond after laser-plasma interaction. This mechanism of the magnetic field amplification may be relevant to the applications that rely of charged beam collimation and hot electrons creation.

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