Extreme magnetic field generation in ultra-intense laser solid interactions

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In the interaction of ultra-intense laser pulses ($> 10^{23}$ W/cm^2) with solid targets it is expected that $\mathcal{O}(0.1)$ MT magnetic fields may be generated, potentially allowing for the experimental study of extreme astrophysical phenomena e.g. relativistic magnetic reconnection. At these extreme laser intensities a significant fraction of the pulse energy may be converted to radiation or electron-positron pairs, potentially limiting magnetic field generation. Using the quantum electrodynamic (QED) module in the OSIRIS particle-in-cell code, we perform several 2D and quasi-3D simulations to study magnetic field generation and create a scaling of magnetic field strength over a range of laser intensities relevant to next-generation laser facilities. We parametrize these results using standard magnetic reconnection parameters, allowing us to define what regime of reconnection may be explored at these facilities. This work was supported by the NSF (1751462). The OSIRIS Consortium (UCLA and IST) provided access to the OSIRIS 4.0 framework (NSF ACI-1339893).