P 15: Poster Session - Laser Plasmas

Time: Tuesday 16:30–18:30 Location: SPA Foyer

P 15.1 Tue 16:30 SPA Foyer

Ultra-intense amplification of ultra-short laser pulses via strongly coupled Brillouin scattering — •Friedrich Schluck, Götz Lehmann, and Karl-Heinz Spatschek — Theoretische Physik I, Heinrich-Heine Universität, Düsseldorf

Plasma based amplification of laser pulses is currently discussed as a key component for the next generation of high-intensity laser systems. Using parametric backscattering processes, the generation of ultra-short pulses in the exawatt-zetawatt regime seems to be possible. We investigate laser seed pulse amplification via strongly-coupled (sc) Brillouin backscattering using three-wave interaction models. The growth of a finite duration seed pulse occurs in a self-similar manner, where the maximum amplitude grows proportional to z^δ, where z is the amplification length. We demonstrate, that δ depends on the initial duration of the seed pulse and interpret this as a variation in the effective seeding power. In order to discuss the potential of reaching the exawatt regime, we extend the basic sc-Brillouin three-wave model to multi-dimensional geometry, including dispersive and weakly-relativistic effects. This allows us to investigate the influence of transverse filamentation and self-focusing effects, which could limit the amplification length and thus the maximum achievable intensity. Results from first two-dimensional numerical simulations are compared to analytic estimates for filamentation and self-focusing.