

Exploiting light's momentum to boost laser wakefield accelerators towards high field physics

Jorge Vieira

Instituto Superior Técnico, Lisbon

In this talk we investigate how can we use and exploit the linear and angular momentum of light towards the production of new kinds of particle and photon beams in plasma accelerators. We have identified a novel scheme capable of producing circularly/elliptically polarised betatron x-rays, which occurs in ionisation injection and direct laser acceleration scenarios driven by lasers with elliptical/circular polarisation. When the laser has orbital angular momentum (OAM) instead, we found a strongly nonlinear regime suitable for high gradient positron acceleration. Shaped electron bunches with a ring-like structure can also be self-trapped by OAM laser driven plasma wave. Finally, we will present a setup capable of capturing radiation reaction effects with currently available laser pulses. We predict strong energy loss due to radiation reaction when scattering a GeV-class laser wakefield accelerated electron bunch in an intense and short counter-propagating laser pulse.