Plasma Irradiated with a High-Intense Laser Beam Carrying an Orbital Angular Momentum

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Allen *et al.* [1] demonstrated that electromagnetic wave might carry orbital angular momentum (OAM) while propagating in a vacuum. These laser beams, characterized with a Poynting vector precessing around the propagation axis and described mathematically with "Laguerre-Gauss"functions (LG) in the paraxial approximation, have recently attracted the attention of the laser-plasma community for their potential applications to particle acceleration, quasi-static magnetic field generation and wakefield excitation.

In CELIA, we have theoretically and numerically studied how low-density plasma and electrons are gaining Orbital Angular Momentum from the laser [2]. By studying the plasma/LG beam interaction, we have shown that the laser to electron OAM transfer is facilitated in a process similar to the "Direct Laser Acceleration" [3]. When this process is controlled by the laser polarization, it could generate a "wireless solenoid", where MegaGauss quasi-static magnetic field are produced [4].

We will also present how the Raman backward scattering of a laser beam propagating in plasma is modified when it is carrying an OAM.

References

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