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Laser-Plasma Interactions in Magnetized Environment[1]

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Propagation and scattering of lasers present new phenomena and applications when the plasma medium becomes magnetized. Starting from mega-Gauss magnetic fields, laser scattering becomes manifestly anisotropic [arXiv 1705.09758]. By arranging beams at special angles, one may be able to optimize laser-plasma coupling in magnetized environment. In stronger giga-Gauss magnetic field, laser propagation becomes modified by relativistic quantum effects [PRA 94.012124]. The modified wave dispersion relation enables correct interpretation of Faraday rotation measurements of strong magnetic fields, as well as correct extraction of plasma parameters from the X-ray spectra of pulsars. In addition, magnetized plasmas can be utilized to mediate laser pulse compression [PRE 95.023211]. Using magnetic resonances, it is not only possible to produce optic pulses of higher intensity, but also possible to amplify UV and soft X-ray pulses that cannot be compressed using existing technology.

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