Effect of dephasing length on wakefield acceleration in magnetoplasma channels

N. K Jaiman[1] and B S Sharma[2]
[1]*Department of pure and applied Physics, University of Kota , India.*
[2]*Department of Physics, Govtcollege Kota, India.*

An analytical and numerical investigation of nonlinear propagation of a circularly polarized Gaussian ultrashort laser beam (power ~ 10^{19} W/cm^2) through a preformed inhomogeneous magnetoplasma channel (plasma density ~ 10^{19} cm^{-3}) with parabolic density profile has been carried out. The laser pulse depletes its energy to the wake over a distance. The wake travels at the group velocity of the laser, the electrons accelerated by the wake will outrun the wake and they slip into the decelerating phase over a distance called dephasing length. The beam slippage is controlled by the external magnetic field. It has been observed that the dephasing length increases linearly with the ratio $\omega_c/\omega_p \leq 2.5$, where ω_c is the cyclotron frequency and ω_p is the electron plasma frequency. The decreasing length or the accelerating length increases with the external magnetic field and the relativistic gamma factor.