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# Harmonic Effects in Propagation of Intense Laser Beam Through Quantum Plasma Under the Influence of Wiggler Field

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Classical plasma physics has mainly focused on regimes of high temperatures and low densities, in which quantum mechanical effects play no role. Plasma where the density is quite high and the de–Broglie thermal wavelength associated with the charged particle approaches the electron Fermi wavelength and exceeds the electron Debye radius, the study of quantum effects becomes important [1,2]. The high density quantum plasma and short pulse laser interaction has gain importance due recent studies on inertial confinement fusion, THz generation and Generation of magnetic field etc. Harmonic generation [3,4] offers an alternative source for short wavelength generation and important tool for diagnostics of nonlinear media. With the development of high intensity short pulse lasers, the electron motion becomes highly nonlinear giving rise to nonlinearity. The nonlinear effects are more dominant in high density quantum plasma. Since quantum plasma is a highly dispersive medium, the phase matching conditions are not satisfied, thereby making the process non-resonant. If the process of harmonic generation is made resonant, then the efficiency of the process can be enhanced significantly. In present work the nonlinear theory of propagation of intense laser pulses in magnetized quantum plasma is presented using quantum hydrodynamic (QHD) model [5,6]. The effects associated with the Fermi pressure, the Bohm potential and the electron spin have been taken into account. The linearly polarized radiation propagates in the presence of a wiggler magnetic field applied perpendicular to the direction of propagation. Wiggler magnetic field plays both a dynamic role in producing the traverse harmonic current as well as kinematical role in ensuring phase-matching. Dispersion of the incident radiation and generation of its harmonics are studied.

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