# Kinetic theory of Lorentzian distributed twisted wave.

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The orbital angular momentum states have been studied in the regime of Classical and Quantum Optics. However, recently Mendonca et al. have predicted the theoretical foundations of intense Laser beam having orbital angular momentum state for Laser-Plasma interaction. It exhibits paradigmatic alteration of Inverse Faradays effect. The orbital angular momentum states are being studied for plasma vortices. In this regard, Kinetic theory developed for the orbital angular momentum state is based on Maxwellian distribution of the plasma constituents. However, most of the Space Plasmas and some of the Laboratory Plasmas exhibit non-thermal/non-Maxwellian behavior due to spatial variation of number density, temperature, magnetic field intensity and background turbulence. In this regard, it would be very interesting if we can develop a kinetic theory that can help us in understanding the effect of orbital angular momentum part of the waves on these non-thermal plasma systems.
The kinetic theory of electrostatic twisted waves instability in a dusty plasma is developed in the presence of orbital angular momentum of the helical (twisted) electric field in plasmas with kappa distributed electrons, ions, and dust particles. The kappa distributed electrons are considered to have a drift velocity. The perturbed distribution function and helical electric field are decomposed by Laguerre-Gaussian mode functions defined in cylindrical geometry. The Vlasov-Poisson equation is obtained and solved analytically to investigate the growth rates of the electrostatic twisted waves in a non-thermal dusty plasma. The growth rates of the dust ion acoustic twisted mode (DIATM) and dust acoustic twisted mode (DATM) are obtained analytically and also pictorial presented numerically. The instability condition for the DIATM and DATM is also discussed with different plasma parameters. The growth rates of DIATM and DATM are larger when the drifted electrons are non-Maxwellian distributed and smaller for the Maxwellian distributed drifted electrons in the presence of the helical electric field.

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