

Comparative Study of Soliton Collisions in Uniform and Nonuniform Magnetized Plasma

Authors : Renu Tomar, Hitendra K. Malik, Raj P. Dahiya

Abstract : Similar to the sound waves in air, plasmas support the propagation of ion waves, which evolve into the solitary structures when the effect of non linearity and dispersion are balanced. The ion acoustic solitary waves have been investigated in details in homogeneous plasmas, inhomogeneous plasmas, and magnetized plasmas. The ion acoustic solitary waves are also found to reflect from a density gradient or boundary present in the plasma after propagating. Another interesting feature of the solitary waves is their collision. In the present work, we carry out analytical calculations for the head-on collision of solitary waves in a magnetized plasma which has dust grains in addition to the ions and electrons. For this, we employ Poincaré-Lighthill-Kuo (PLK) method. To lowest nonlinear order, the problem of colliding solitary waves leads to KdV (modified KdV) equations and also yields the phase shifts that occur in the interaction. These calculations are accomplished for the uniform and nonuniform plasmas, and the results on the soliton properties are discussed in detail.

Keywords : inhomogeneous magnetized plasma, dust charging, soliton collisions, magnetized plasma

Conference Title : ICNPS 2014 : International Conference on Nuclear and Plasma Sciences

Conference Location : London, United Kingdom

Conference Dates : November 28-29, 2014