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Inspiring results for the formation of non-linear 'solitary waves' in space plasmas due to relativistic and quantum effects

The relativistic effects in electrons and ions particularly during magnetic storms and solar fluxes in outer and inner radiation belts, magnetospheric regions affect the linear behavior of the plasma modes faced by space probes/missions of any kind by the world community. Recently observed characteristic changes in space probes due to the presence of the charged dust particles and quantum effects in certain domain of wave phenomena are some additional causing factors of complexity. The fascinating well behaved nonlinear structure – 'solitary waves' found in space plasmas engulfing interplanetary regions are an interesting area of research. The regions of existence of these structures with variable pressures occurring usually in space subject to relativistic and quantum effects in plasmas/dusty plasmas under well-defined conditions may be helpful to deal with these complexities. Due to inclusion of relativistic effects $\frac{2T_e}{T_i}$ in plasma particles, the usual condition for the formation of nonlinear solitary waves in warm plasmas necessitates to redefine or modify some entity. Our model: investigation of inertia of electrons demands an unusual result $v_{th,e} << cs << v_{th,i}$. because in usual plasma modes, isothermal ions are to satisfy $v_{th,i} << cs$ and adiabatic electrons to satisfy $v_{th,e} >> cs$ i.e $v_{th,i} << cs << v_{th,e}$. for high temperature T_e. This inspires us to redefine C_s with relativistic effects which admit the feasible condition . In the second attempt of multi component dusty plasmas with quantum effects in the inertia less electrons, we have established a special method through a differential equation to deduce the 'energy integral' (which is usually not possible in general) to show the existence of the nonlinear solitary waves. A new quantum parameter C_2 with defined range connecting the quantum term of the plasma wave equation is unearthed to predict the existence of solitary waves in dusty plasma.

Biography

Bhaben Chandra Kalita has completed his PhD from Gauhati University in the field of Non Linear Plasma Waves. He is serving as Professor Emeritus at present in the Department of Mathematics, Gauhati University after retirement. He has published more than 40 papers in reputed journals like Physics of Fluids-B in brief communication, *Physics of Plasmas, Astrophysics and Space Science, Journal of Plasma Physics, Physical Society of Japan, Communication in Theoretical Physics, Plasma Physics Reports, Journal of Mathematics-A Gen.*, etc.

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He has completed his PhD at the age of 45 years from Gauhati University, Assam, India. He has published the papers in reputed journal Astrophysics and Space Science are (a) "Weakly Relativistic Solitary Waves in Multicomponent Plasmas With Electron Inertia", Vol. 338,87-90, 2012,Springer, (b) "Investigation of Solitary Waves in Warm Plasma for Smaller Order Relativistic Effects with Variable Pressures and Inertia of Electrons", Vol. 343, 609-614, 2013, Springer, (c) "Investigation of Ion Acoustic Solitons (IAS) in a Weakly Relativistic Magnetized Plasma", Vol. 347, 109-117, 2013, Springer" and he has presented the paper in "XXXI International Conference of Phenomena in Ionized Gases (ICPIG-2013) Granada, Spain.

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