

## **Modes of propagation in relativistic self-gravitational plasma**

Shweta Jain<sup>1,2</sup> and Prerana Sharma<sup>2</sup>

<sup>1</sup>Physics Department, N.S.C.B. Govt. PG College, Biaora, M. P. - 465674, India

<sup>2</sup>Physics Department, Ujjain Engineering College, Ujjain, M. P. - 456010, India  
e-mail: [jshweta09@gmail.com](mailto:jshweta09@gmail.com)

The paper describes the modes of propagation and instability in the relativistic self-gravitational electron ion plasma using magnetohydrodynamic double polytropic laws. The model equations of the self-gravitational plasma system are enclosed by the double polytropic laws. The propagation of wave modes and gravitational instability are analysed considering rotation and different pressure parallel and perpendicular to the wave propagation. By applying the normal mode analysis technique, the general dispersion relation is obtained. The different direction of wave propagations outcomes in modified sound wave, magnetosonic wave and Alfvén wave. The associated wave modes and instability considering effects of self-gravitation and rotation are discussed analytically as well as numerically. The obtained results of relativistic anisotropic magnetohydrodynamic plasma model are applicable to various astrophysical plasma situations.