



Small amplitude waves, firehose and mirror instabilities in polytropic quantum plasma

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The small amplitude quantum magnetohydrodynamic (QMHD) waves and linear firehose and mirror instabilities in dense quantum plasma have been investigated using generalized polytropic pressure laws. The QMHD model and Chew–Goldberger–Low (CGL) set of equations are used to formulate the basic equations of the problem. The general dispersion relation is derived using normal mode analysis which is discussed in parallel, transverse, and oblique wave propagations. The fast, slow, and intermediate QMHD wave modes and linear firehose and mirror instabilities are analyzed for isotropic MHD and CGL quantum fluid plasmas. The firehose instability remains unaffected while the mirror instability is modified by polytropic exponents and quantum diffraction parameter. The graphical illustrations show that quantum

corrections have a stabilizing influence on the mirror instability. It is also observed that the growth rate stabilizes much faster in parallel wave propagation in comparison to the transverse mode of propagation.

The quantum corrections and polytropic exponents also modify the pseudo-MHD and reverse-MHD modes in dense quantum plasma. The phase speed (Friedrichs) diagrams of slow, fast, and intermediate wave modes are illustrated for isotropic MHD and double adiabatic MHD or CGL quantum plasmas, where the significant role of magnetic field and quantum diffraction parameters on the phase speed is observed.