Area Seminar

Title	Study of cold and dense neutron star matter
Date and Time	03/12/2009 16:00:00
Speaker	Dr. Debarati Chatterjee Professor Saha Institute of Nuclear Physics, Kolkata
Area	Theoretical Physics
Venue	Room No. 469

Abstract

Neutron stars are unique astrophysical laboratories to study cold and dense matter under extreme conditions. It is been suggested that strange matter such as hyperons, kaons or even deconfined quarks can appear at the high densities prevailing in the neutron star core. When a neutron star is perturbed, it can be set into non-radial oscillations, emitting gravitational waves at characteristic frequencies of its quasi-normal modes. The pulsation modes are classified according to the different restoring forces, such as Coriolis restored r-modes. R-modes are unstable to gravitational radiation reaction driven instability in rapidly rotating neutron stars. The detection of gravitational waves emitted by an oscillating star may soon become possible with the upcoming generation of gravitational wave detectors. It is conjectured that r-mode oscillations could be effectively suppressed by bulk viscosity due to non-leptonic weak processes involving exotic matter in the neutron star interior. We used relativistic field theoretical models to construct the equations of state and calculated the coefficient of bulk viscosity due to non-leptonic weak interactions involving various compositions of strange neutron star matter. The influence of exotic particles and their associated bulk viscosity on the gravitational radiation reaction driven instability in the r-modes was investigated. Another pulsation mode is the pure space-time mode known as w-mode. Axial w-modes carry information on both the structure of the neutron star matter and the nature of hadronic interactions. We studied the problem of extracting information about the composition and equation of state (EoS) of the neutron star interior using axial w-modes, whose frequency and damping time can be extracted from the observation of gravitational waves.