Journées des théoriciens nucléaires



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Hydrodynamic modes in neutron star crust

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Neutron stars are compact objects, created in supernova explosions at the end of the life of massive stars. They contain matter under extreme conditions, in particular concerning the density starting from a lattice of (neutron rich) nuclei in the crust one reaches nuclear matter at several times the saturation density in the center. After a short introduction about neutron stars I will focus my presentation on the inner crust, where we can find an interesting nuclear structure often called the "Pasta Phase". This phase is characterised by the alternating slabs of very symmetric and almost symmetric nuclear matter. I have used superfluid hydrodynamics to valuate the spectrum of the lowest lying excitations within this phase. I will discuss the resulting spectra for different overall densities and the consequences for heat capacity of this phase. I will explain the formalism which I developped in order to obtain hydrodynamic modes for superfluid nuclear matter in that structure.

Then I will present differents excitation spectrum for that kind of collective mode and discuss there influence on neutron star properties like heat capacity.

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