Neutron rich nuclear matter Equation of State in nuclear physics

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Program of the course:

The equation of state (EOS) of nuclear matter will be investigated in different regions of nuclear densities, analyzing several aspects connected with heavy ion collisions from Fermi toward relativistic energies. Some aspects and properties of resonances and collective motions in nuclear physics will also be discussed. A special focus on the experimental tools used to extract the resonances and the connection with the EOS will be given.

Syllabus
- Equation of state of infinite nuclear matter
- Symmetry energy in finite system
- Eos of asymmetric nuclear matter
- Experimental investigation of the equation-of-state in isospin-asymmetric matter at low densities.
- Experimental investigation of the equation-of-state in isospin-asymmetric matter at high densities.
- Connection of EOS with multi-messenger astrophysics
Basic Resonances in nuclei
Giant and Pygmy resonances
Experimental techniques to measure resonances and extract information on EOS

Bibliography:

2. A. Sorensen et al., “Dense nuclear matter equation of state from heavy-ion collisions” Progress in Particle and Nuclear Physics, 134 (2024) 104080
4. M. Harakeh and A. van der Woude, Giant Resonances, Fundamental High-Frequency Modes of Nuclear Excitation, Oxford University Press
5. P.F. Bortignon and A. Bracco and A. Broglia Giant Resonances, Routledge Edition
6. X. Roca Maza, N. Paar Nuclear equation of state from ground and collective excited state properties of nuclei, Progress in Particle and Nuclear Physics, Volume 101, 2018, Pages 96-176, ISSN 0146-6410
7. Scientific papers and slides provided by the teacher