Probing the structure of light nuclei produced by fragmentation with FAZIA

The study of fragmentation reactions produced in heavy-ion collisions has permitted major advances in the understanding of the dynamics and thermodynamics of nuclear matter and is still one of the most promising tools to constrain its equation of state. This fundamental properties in nuclear physics is also a crucial ingredient in the understanding of various astrophysical objects or phenomenon: dynamics of supernovae explosion and structure of the remanent neutron star, or interpretation of signals coming from neutron star merger such as gravitational waves.

Up to now, a crucial ingredient was missing in most fragmentation experiments: the **isotopic composition** of reaction products was only accessible for the lightest fragments. In this context, the FAZIA collaboration has developed a new generation detector able to measure the charge and mass of fragments up to Z=25 with a spectrometer-like resolution over a broad angular range. Twelve FAZIA modules are currently mounted in GANIL to replace the forward part of INDRA. The **FAZIA@INDRA** coupling is one of the most powerful detector to constrain the **nuclear equation of state asymmetry term**. The identification quality of FAZIA also allows to investigate nuclear **collision dynamics**, **clusterization** process at low density, and **light nuclei structure** and decay modes.

During this internship, the candidate will study the **structure of ^{11}C** through the characterization of the **decay modes** of excited states above the charged particles emission threshold. Experimental data were acquired at LNS Catania in March 2017 and are ready to be analyzed. This study will be a good occasion for the candidate to deal with multi-parametric analysis using C++ libraries such as ROOT or KaliVeda.

Requested skills: nuclear physics, bases in object oriented programming.
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