PhD position in experimental nuclear physics

Development of INCL++, towards the application of the intranuclear in ion collisions below 100 MeV per nucleon

High-energy heavy-ion collisions have being described theoretically since long within the two-step scenario. In the first instants of the ion-ion reaction, a series of nucleon-nucleon collisions allows the dissipation of a large part of the kinetic energy of the participants. This process generates fast particles and light fragments, which escape the nuclear system. The remaining nucleons are described by a statistical distribution which is asymptotically uniform and forms a highly excited nuclear system, whose decay occurs via collective mechanisms such as evaporation, fission or more generally fragmentation.
The intranuclear cascade of Liège (INCL) has been developed in this framework. A recent effort was undertaken to include a C++ version of INCL into the GEANT4 package (INCL++), with emphasis on nucleon and light-ion projectiles, essentially motivated by applications such as accelerator - driven systems and proton and light-ion cancer treatment.
Even though the founding hypotheses of the two-step scenario rely on the "high-energy" assumption, the comparison of this model with experimental data shows that its predictive power may extend down to energies as low as a few 10 MeV per nucleon. Increasing the predictive power of INCL++, in particular towards more exclusive observables such as emitted-fragment correlations, will be extremely useful for various applications.
The work proposed here aims at exploring the potential improvements of INCL++ to describe, in a unified way, ion-ion collisions in the energy domain below 100 MeV per nucleon and recently published data of an experiment performed at GSI at 1 GeV per nucleon. This work will be done in collaboration with IRFU/DPhN at CEA-Saclay.

Expected skills:
Nuclear and particle physics, C++ programming

Contact: Jean-Eric Ducret
GANIL, BP 55027, 14076 Caen France
Phone: +33 (0)2 31 45 44 51
mail: ducret_at_ganil.fr