**ICNT workshop on deuteron induced reactions and beyond: Inclusive breakup fragment cross sections.**

About 12 nuclear theorists and nuclear experimentalists attended a focused workshop with a view on establishing a formalism that integrates consistently the variety of processes driven by the effective nucleon–target interaction (optical potential). This program was funded by the International Collaborations in Nuclear Theory (ICNT), and was held at FRIB from July 18th to July 22nd 2016.

The workshop aimed to define appropriate observables in the overlapping domains of single-particle spectroscopy, surrogate reactions, and nuclear astrophysics, and compare them to calculations from state-of-the-art reaction and structure frameworks. Some of the highlights were:

* Three independent codes dealing with inclusive breakup were recently independently developed. The formalism employed was very similar, and we have worked together to test the consistency of these implementations.
* A specific solution to the quantum three body problem in the context of nuclear reactions has been proposed. This approach has proven to be particularly adapted for the treatment of inclusive breakup reactions.
* We have studied the possibility of predicting the spin, energy and parity of the compound nucleus formed after a (d,p) or (d,n) reaction. This is essential in order to implement the surrogate method for neutron and proton capture reactions. This will allow for the experimental determination of nucleon capture away from stability.
* The discussed formalism shed light on the reaction mechanism of deuteron induced reactions, allowing for the theoretical separation of the breakup cross section in an elastic and a non elastic term.
* The population of states in the resonant and non-resonant continuum has been consistently described.
* We have discussed the integration in the reaction formalism of general nucleon-target effective interactions. It has been concluded that non-local, dispersive potentials (such as those derived within the Dispersive Optical Model) have to be used in order to consistently account for the structure aspects of the reactions under study.
* It has been concluded that the implementation of microscopic or semi-microscopic effective nucleon-target interaction can give the theory predictive power when moving towards the drip lines.
* We have started writing a paper studying (d,p), (d,n) and gamma decay in three study cases: 40Ca, 48Ca and 60Ca. The concepts described above are being applied to these Calcium isotopes.
* Current and future experimental capabilities have been discussed in the context of FRIB and also in relation to developments in instrumentation (for example, GRETINA, ORRUBA, HELIOS, AT-TPC, LENDA, VANDLE). Opportunities for experiments in other US facilities have also been discussed.