Second week

Expectations: The student will be introduced to a number of methods for practical applications for the analysis of experiments, and gain confidence in selection of the inputs involved and the validity of the approximations used.

- Channel Coupling: Continuum: the bin representation and continuum-continuum couplings. The interfaces between nuclear structure and reactions, nucleon and cluster models, overlap functions of one and two particles, spectroscopic strengths and associated form-factors. (Monday, week 2) – Lecturer Tostevin

- Semiclassical concepts: time dependent approaches, Coulomb excitation, first-order perturbation theory and higher-order corrections, post-acceleration, virtual photon description. Example: Coulomb dissociation of halo nuclei. (Tuesday, week 2) – Lecturer Moro

- Eikonal methods: derived eikonal equations for point particles, the eikonal solutions for phase shifts and the S-matrix. Eikonal and optical limit techniques for composite projectiles. Elastic, reaction and other cross sections and the content of momentum distributions. Example: analysis of knockout reactions including momentum distributions. (Wednesday, week 2) – Lecturer Tostevin

- Transfer reactions: Approximations. From exact and perturbative amplitudes, Q-value, momentum and L-transfer matching, periphery analysis. The adiabatic approximation for breakup and transfer, Johnson and Soper-like methods for transfer, zero-range and finite range effects. Example: analysis of (d,p) reactions including extraction and sensitivity to spectroscopic factors and the ANC. (Thursday, week 2) – Lecturers Nunes, Tostevin

- WKB approximation. Capture reactions: direct and resonant, S-factor, low-energy behaviour. Fusion reactions and barrier penetration methods. Channel-coupling and fusion enhancement. Examples: determine the capture reaction cross sections for an E1 process assuming simplified states, Coupled-channels barrier-passing fusion calculations. (Friday, week 2) – Lecturers Descouvemont, Tostevin