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Nuclear orientation in transfer reactions

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Measurements of nuclear magnetic moments are of current interest at RIB facilities, because they provide key information about the states of interest, e.g. about their wave functions.
A basic requirement for the measurement of magnetic moments is the existence of an initially spin-aligned nuclear ensemble. We report here that transfer reactions are applicable for such studies. As the orientation of the nuclear spins is induced directly by the reaction, transfer reactions allow the investigation of nuclear moments of very short lived states, in the range of nanosecond to microseconds. With the development of post-accelerated radioactive beams, available in ISOL facilities, highly-excited neutron-rich isomers will become accessible for measurement. These studies will yiels basic informations about the configuration of these states and thus provide a stringent test for nuclear theories.
The possibility of using transfer reactions for nuclear moment measurements of isomeric states in PAD experiment will be discussed. The results of four experiments held in the Tandem facility of the Insitut de Physique Nucleare (IPN Orsay, Paris), involving single-nucleon and multi-nucleon reactions will be illustrated, along with advantages and disadvantage of each reation method. The experiments aimed at studies of the g-factors of the 65mNi 9/2- and 66mCu 6- isomeric states, which were populated in single nucleon transfer reaction (d,p). In the 43mSc case, the 19/2- isomer was populated in the exchange of two neutrons and a proton from the target to the projectile nuclei. The 6- isomeric state in 64mCu was studied with a single-nucleon transfer in inverse kinematics. In all the cases the amplitude of the R(t) function, a measure of the nuclear spin orientation in TDPAD experiment, will be provided. For the case of multinucleon transfer, as different beam energies were used, the orientation is investigated as function of projectile's energy. The results from the fourth experiment have demonstrated the level of difficulties one can encounter using inverse kinematic reactions.

Primary authors: BALABANSKI, Dimiter (Univ. of Camerino & INRNE Sofia); FIORI, Enrico (Cen. de Spect. Nucl. & Spect. Masse (CSNSM)); GEORGIEV, Georgi (Cen. de Spect. Nucl. & Spect. Masse (CSNSM))

Presenter: FIORI, Enrico (Cen. de Spect. Nucl. & Spect. Masse (CSNSM))

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