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SpecMAT, the active target for nuclear transfer reactions studies at ISOLDE, CERN

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SpecMAT is an active target developed for studying the shell evolution in exotic isotopes and observing the fundamental aspects of the nuclear structure far from stability via transfer reactions carried in inverse kinematics. The active target, which is a novel modification of a time projection chamber, can acquire three-dimensional tracks of light reaction products and work in coincidence with the scintillation array sensitive to gamma-rays emitted by the heavy reaction products. The SpecMAT is currently at its final developmental stage undergoing characterisation measurements at ISOLDE, CERN. During the most recent characterisation, SpecMAT was installed in the ISOLDE Solenoidal Spectrometer, which generated a magnetic field of 2.5 T. This characterisation was performed offline using a standard alpha source. In this measurement spiral tracks of alpha particles were successfully observed in the time projection chamber of the detector. Gamma rays emitted in the decay chain of 241Am were detected in coincidence with the particle tracks by the scintillation array. With this characterisation, we demonstrated that all detector components could operate in the strong magnetic field and are ready for future online experiments.

In this talk, recent Geant4 simulations of transfer reactions that can be studied with SpecMAT also will be presented. Using the newly developed simulation toolkit, SpecMATscint, we demonstrated the feasibility of studying the shell evolution in the chain of neutron-rich copper isotopes via a (d,3He) transfer reaction.

Primary author: POLESHCHUK, Oleksii (KU Leuven, Instituut voor Kern- en Stralingsfysica, Celestijnenlaan 200d, 3001 Leuven, Belgium)

Presenter: POLESHCHUK, Oleksii (KU Leuven, Instituut voor Kern- en Stralingsfysica, Celestijnenlaan 200d, 3001 Leuven, Belgium)

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