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## **LISE++ : exotic beam production with fragment separators and their design**

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The LISE++ program\* is designed to predict intensities and purities for the planning of future experiments with in-flight separators, but is also essential for radioactive beam tuning where its results can be quickly compared to on-line data. This is achieved via the simulation of fragment separators through the use of different sections called "blocks" (magnetic and electric multipoles, solenoid, velocity filter, RF deflector and buncher, material in beam, drift, rotation element, and others). The code is built around a user-friendly interface that helps to seamlessly construct any fragment separator from the different blocks. The LISE++ package includes configurations of existing separators at NSCL/MSU, RIKEN, GANIL, GSI, FLNR/JINR, TAMU and others. The Projectile Fragmentation, Fusion-Evaporation, Fusion-Fission, Coulomb Fission, and Abrasion-Fission models are used in the program to simulate experiments at beam energies above the Coulomb barrier.

Since the LISE++ code presentation at the EMIS 2007 conference, important improvements were performed in the analytical and Monte Carlo calculations of transmission, and accuracy of reaction product distributions. Large progress has also been achieved in ion-beam optics with the introduction of elemental blocks that enable a new type of configuration, labeled "extended (or elemental)" in addition to the classic "sector" configuration. Optical matrices can now be calculated within the LISE++ code (up to second order), directly input by the user, or linked to COSY maps (up to fifth order). This enables a detailed analysis of the transmission, useful for fragment separator design, and is a powerful tool to calculate angular acceptances, and display ion-beam optics characteristics. In the latest version of the program, export/import of TRANSPORT files is now possible, with minimization of quadrupole fields following user constraints.

The future development of LISE++ will be announced in this presentation, and will be discussed in detail in a poster presentation.

- O.B.Tarasov and D.Bazin, Nuclear Instruments and Methods in Phys.Research B 266 (2008) 4657–4664

The LISE++ package which includes also the PACE4, Global, Charge, Spectroscopic calculator codes can be downloaded freely from the following site: <http://lise.nscl.msu.edu>.

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