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Rare isotopes production with next-generation in-flight separators

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The next generation of nuclear physics research will require advanced exotic beam facilities based on heavy-ion drivers. Exotic beams of rare nuclei will be produced via fragmentation and fission reactions resulting from a high-energy heavy-ion beam hitting a target. A large aperture fragment separator with superconducting magnets is needed for capture, selection, and transport of rare isotopes for experiments. For rare isotope registration the multi-stage separation is required to provide reasonable rates in detectors located in an analyzing stage. So, the recent experiment devoted to explore the ^{60}Ca region at the RIKEN RIBF facility [1] demonstrated a necessity to have three-stage separation to approach the neutron-dripline in the calcium region. Another important aspect according to the LISE^{++} code calculations [2] in these new research is multi-step reactions taking into account. Momentum compression technique applied in a fragment-separator wedge-selection section and rare isotope beams slowing down line in front of a gas-cell will be discussed.

References:

1. O.B. Tarasov et al., Phys. Rev. Lett. 121, 022501 (2018).
2. O.B. Tarasov and D.Bazin, Nucl. Instrum. Methods Phys.Res., Sect. B 266, 4657 (2008), http://lise.nscl.msu.edu.

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