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PIPERADE: A Penning-trap based separator for the future low energy branch DESIR at SPIRAL2

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The DESIR facility at SPIRAL2 is dedicated to low energy nuclear studies using exotic nuclei currently not accessible. Nuclear structure and astrophysics studies will be performed on these nuclides using beta decay spectroscopy, laser spectroscopy and trap-based experiments. In order to achieve the targeted precision, extremely pure samples of these exotic nuclides are needed.

PIPERADE, a system consisting of a radiofrequency (RFQ) cooler and buncher and a double Penning trap, will be located at the entrance of the DESIR beamline to purify the radioactive ion beams from undesired contaminants. The RFQ will create ion bunches with a transverse and longitudinal emittance about 3 π.mm.mrad and 10 eV.μs respectively. Thereafter the first Penning trap will perform isobaric purification and the second Penning trap will accumulate the ions of interest. Design and current status will be presented.

The challenge for PIPERADE is to separate very large amounts of short-lived nuclei (10^5 ions per bunch) while maintaining the resolving power of 10^5 for isobar selection. For this purpose, studies on space charge effects and new excitation schemes are ongoing and will be presented.

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