

OEDO project – Slowing-Down Beam Line in RIKEN RIBF[†]

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The RI beam facility (RIBF) at RIKEN has expanded the variety of nuclides, which provides numerous kinds of exotic isotope beams with $A > 100$ by using the in-flight fission or the projectile fragmentation reactions of U or other heavy ions at 345 A MeV. Because of the energy of the primary beam, available energies of RI beams have been restricted to an energy region typically above 200 A MeV. The variety of reaction has not been necessarily expanded on this point. The deceleration of intense RI beams provided in the RIBF enables us the further research based on exotic nuclei/exotic states by low-energy reactions such as transfer and incomplete/complete fusion and others. For this purpose, we have set up OEDO (Optimized Energy Degrading Optics for RI beam) project, where a new energy-degrading beam line in the RIBF have been constructed consisting of two quadrupole magnets, an RF electric deflector and a mono-energetic degrader. The application of energy degrader is a general method to degrade the beam energy, while it induces the broadening of beam spot due to the angular and momentum aberrations. In the OEDO beam line, an RF electric deflector is employed to cancel the aberrations based on the time structure of the beam bunch corresponding to the velocities of the ions. The basic idea, the design, the performances in the commissioning experiment, and some physics experiments are presented as well as possible future physics programs and applications.

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