



国立研究開発法人理化学研究所 仁科加速器研究センター  
第271回 RIBF核物理セミナー  
RIKEN Nishina Center for Accelerator Based Science  
The 271st RIBF Nuclear Physics Seminar



## Experiments with thermalized RIB at the FRS

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At the FRS Ion Catcher at GSI/FAIR, projectile and fission fragments are produced at relativistic energies at the FRS, separated in-flight, range-focused, slowed-down and thermalized in a cryogenic stopping cell and transmitted to a multiple-reflection time-of-flight mass spectrometer (MR-TOF-MS). The MR-TOF-MS can perform direct mass measurements of exotic nuclei, to provide an isobarically and isomerically clean beam for further experiments, and as a versatile diagnostics device to monitor the production, separation and manipulation of exotic nuclei.

More than 30 short-lived ground state masses have been measured with high mass accuracies (down to  $6E-8$ ). The excitation energies of isomers and isomeric ratios were determined using mass spectrometry, and, for the first time, an isomeric beam was prepared using an MR-TOF-MS. The unique combination of performance parameters make the MR-TOF-MS the system of choice for measuring the masses of very exotic nuclei and for the search for new long-lived isomeric states. The stopping cell can also be used as an ion trap and together with the MR-TOF-MS allows to measure simultaneously masses, half-lives, decay branching ratios and isomer excitation energies. All this is the basis for a broad scientific program in FAIR phase-0, including measurements of masses for the 3rd peak of the r-process and  $N=Z$  nuclei below  $100\text{Sn}$ , beta-delayed neutron emission probabilities and multi-nucleon transfer reactions.

The next generation stopping cell for the low-energy branch of the Super-FRS will be presented as well.

\* The talk will be given in English language.

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