Measurements of nuclear magnetic moments near doubly magic ^{132}Sn

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Measurements of magnetic moments of excited states provide a unique insight into the structure of a nucleus. They are very sensitive to single-particle configurations of different excitations and are thus a robust test for nuclear theory.

However, such measurements can be challenging. Various methods can be applied, and the most suitable method depends on the properties of the excited state of interest - such as its lifetime - but also on the production method of the state of interest. In this context, the Time Dependent Perturbed Angular Distribution (TDPAD) and the Time Dependent Perturbed Angular Correlation (TDPAC) methods will be briefly introduced.

The nuclear region around doubly magic nucleus ^{132}Sn is of special importance for the understanding of nuclear structure, since in this region, many states are expected to have single-particle properties. To study this region, two measurements were conducted at the RIKEN Nishina Center in December 2024 to determine the g factors of the 10^+ isomeric state in ^{130}Sn and of the 6^+ state in ^{132}Sn.

The 10^+ state in ^{130}Sn with a lifetime of 2.3 µs was populated in a two-step projectile fragmentation reaction after the two-neutron removal from the ^{132}Sn secondary beam. The implantation of spin-orientated nuclei allowed the analysis of the decay of the 10^+ isomer with the TDPAD method. In the second experiment, the shorter-lived 6^+ state (τ=29 ns) in ^{132}Sn was observed in coincidence with the decay of the 8^+ isomer populating the 6^+ state of interest. This allowed an analysis using the TDPAC method.

The results of these two experiments will be presented and put in the context of theoretical models. Possible follow-up experiments will be discussed.