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Coulomb Excitation of Semi-Magic ^{206}Hg at Miniball ISOLDE

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Singly-magic nuclei in the vicinity of a doubly-magic core are in the scope of interest of modern nuclear physics. Their properties can be described by the few protons (or neutrons) situated outside of the doubly-magic core, therefore, they provide information on the basic ingredients of the shell model, such as single particle energies and two-body matrix elements. One of the most interesting yet weakly known regions to investigate the nature of excitation near closed shells is placed south-east of the doubly-magic ^{208}Pb nucleus.

The successful Coulomb excitation of a singly-magic exotic ^{206}Hg (Z=80, N=126) nucleus was undertaken in November 2017 at the HIE-ISOLDE facility at CERN. The goal of this project was to investigate the electromagnetic structure of ^{206}Hg with a complex energy level scheme, much of which is still unexplored. To date, only the energy of the 2_1^+ state is known along with a number of higher-spin yrast states, while the rest of the low spin level scheme has been only predicted in shell model calculations due to the existence of the long-lived 5^- isomeric state at 2.1 MeV blocking the access to the low-spin region below it and to the non-yrast levels. The B(E2; $2_1^+ \rightarrow 0_1^+$) value as well as the assignment of the newly observed gamma transitions to the theoretically predicted low-energy level scheme of this nucleus were the focus of the recent project. Prior to the experiment, GOSIA simulations were performed based on the theoretical matrix elements, indicating which transitions would be expected.

The ^{206}Hg beam of 4.19 MeV/u energy and the 7.75×10^5 pps intensity was produced using an up to $0.63\ \mu$A proton beam impinging on a molten lead target. In order to enhance beam purity by eliminating the stable ^{206}Pb isobar, laser ionisation was implemented using the RILIS technique. As the Coulomb excitation involved a heavy beam, the experiment was conducted using inverse kinematics with a light target (^{104}Pd and ^{94}Mo, respectively for a number of shifts). This allowed the projectile-like and recoiling target nuclei to be kinematically separated. To detect the scattered particles a Double-Sided Silicon Strip Detector was placed in the forward laboratory angles. The 8 clusters of the MINIBALL HPGe detector array were used to measure the de-exicting gamma rays.

The Coulomb excitation experimental technique allows a wide range of nuclear properties to be extracted including the transition probabilities and spectroscopic quadrupole moments of the excited states. The level of collected statistics in the recent experiment will allow the collectivity and deformation of the ground state and the 2_1^+ state to be determined, as well as place the newly observed gamma transitions on the tentative level scheme of ^{206}Hg.

In this talk the preliminary results of the ongoing Coulomb excitation analysis using the GOSIA code will be discussed.

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