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Lifetimes measurements with MNT reactions at the AGATA-VAMOS++ setup: Exploring the seniority conservation in the semimagic $N = 50$ nuclei above $Z = 40$.

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Multi-Nucleon Transfer (MNT) reactions is a useful mechanism, to perform nuclear structure studies in nuclei moderately far from stability line. Moreover, MNT allows to directly populate the low lying states in the reaction products.

The development of set-ups involving high acceptance tracking magnetic Spectrometers as VAMOS++ [1], coupled with the Advanced GAmma Tracking Array (AGATA) [2] opened new possibilities, especially if they are used in conjunction with the high-intensity stable beams provided by the GANIL laboratory [3]. With such set-ups it is nowadays possible to have sufficient sensitivity to perform precise lifetime measurements using Doppler-shift-based techniques such as the RDDS method [5], employing the plunger, for lifetimes in the range from few tenths to hundreds of picosecond. This technique rely on a precise Doppler correction that can be provided by the position resolution of the AGATA array coupled to VAMOS++ the latter providing an accurate kinematic reconstruction of the detected ejectile. VAMOS++ do not only allows to identify and select the reaction product of interest but also to perform an event-by-event Doppler correction. Additionally, taking advantage of the Total Kinetic Energy Loss (TKEL) measurement, the contribution from the feeding transitions, a major source of systematic errors, can be controlled.

In a recently published work [6] we have use the set-up and techniques described above to perform accurate lifetime measurements in the $N = 50$ isotones with $Z \geq 40$, i.e. with protons occupying the g9/2 orbital. It is well known that seniority is conserved in orbitals with $j \leq 7/2$ while for orbitals with $j \geq 9/2$, seniority breaking effects may be observed being the eigenstates admixtures of states with different seniorities [7,8].

An extensive study of reduced transition probabilities in ^{90}Zr, ^{92}Mo and ^{94}Ru, together with other known B(E2)'s in the $N = 50$ isotones, has allowed us to conclude that seniority is a good quantum number, i.e. is largely conserved, along the $(g_{9/2})^n$ yrast states at $N = 50$. The experimental evidence of the seniority conservation is a direct evidence of the validity of the short-range pairing interaction, with far-reaching implications for nuclear structure.

The capabilities of the mentioned set-up and the experimental findings will be discussed in this contribution

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