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## I-forbidden M1 transitions in $N = 50$ isotones

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Regions near closed shells in areas of the nuclear chart far from stability are very interesting from the point of view of nuclear structure, since a shell model description based on single-particle states can be challenged by collective effects. One of the most interesting regions is the one around the doubly-magic  $^{78}\text{Ni}$  nucleus, with  $Z = 28$  and  $N = 50$  [1],

The systematics of transitions from the first-excited to ground states of the odd- $A$   $N = 50$  isotones [2,3] is very enlightening, since M1 transitions are expected to be  $l$  forbidden, resulting in long half-lives with small transition probabilities [4,5,6,7]. A more complete understanding of these  $l$  forbidden M1 transition could be achieved by extending the systematics. To this end, two complementary experiments were performed at the ISOLDE (CERN) facility and ILL reactor in Grenoble, France.

The nuclei of interest were populated in  $\beta$  decay and investigated by fast-timing techniques. The first experiment was aimed at the study the half-life of the first excited state of the  $^{83}\text{As}$  via a  $\beta$ -decay experiment of  $^{83}\text{Ga}$  at the ISOLDE Decay Station.

In the second experiment, the half-lives of the first excited states in  $^{85}\text{Br}$  and  $^{87}\text{Rb}$  [8] were investigated at ILL, where the parent nuclei,  $^{85}\text{Se}$  and  $^{87}\text{Kr}$ , were transported and mass-separated by the LOHENGRIN is a recoil mass spectrometer.

The presentation will address the analysis of both experiments, discussing the methodologies used and the preliminary results obtained. Additionally, conclusions regarding the systematics of the  $l$ -forbidden M1 transitions in  $N = 50$  isotones will be drawn, highlighting the implications for nuclear structure.

### References:

- [1] R. Taniuchi et al. " $^{78}\text{Ni}$  revealed as a doubly magic stronghold against nuclear deformation". En: Nature 569.7754 (2019), págs. 53-58. doi: <https://doi.org/10.48550/arXiv.1912.05978>.
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- [5] I.M. Govil y C.S. Khurana. "Systematics of  $l$ -forbidden M1 transitions". En: Nuclear Physics 60.4 (1964), págs. 666-671. issn: 0029-5582. doi: [https://doi.org/10.1016/0029-5582\(64\)90102-6](https://doi.org/10.1016/0029-5582(64)90102-6).
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- [8] T.D. Johnson y W.D. Kulp. "Nuclear Data Sheets for  $A = 87$ ". En: Nuclear Data Sheets 129 (2015), págs. 1-190. issn: 0090-3752. doi: <https://doi.org/10.1016/j.nds.2015.09.001>.

## Abstract

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The nuclei of interest were populated in  $\beta$  decay and investigated by fast-timing techniques. The first experiment was aimed at the study the half-life of the first excited state of the  $^{83}\text{As}$  via a  $\beta$ -decay experiment of  $^{83}\text{Ga}$  at the ISOLDE Decay Station.

In the second experiment, the half-lives of the first excited states in  $^{85}\text{Br}$  and  $^{87}\text{Rb}$  [8] were investigated at ILL, where the parent nuclei,  $^{85}\text{Se}$  and  $^{87}\text{Kr}$ , were transported and mass-separated by the LOHENGRIN is a recoil mass spectrometer.

The presentation will address the analysis of both experiments, discussing the methodologies used and the preliminary results obtained. Additionally, conclusions regarding the systematics of the  $l$ -forbidden M1 transitions in  $N = 50$  isotones will be drawn, highlighting the implications for nuclear structure.

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