

Imaging ^{54m}Ni proton radioactivity with ACTAR TPC

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The proton radioactivity of the 10^+ isomer in ^{54}Ni could be observed [1] in an experiment performed at GANIL with the ACTAR TPC detector. Together with the previously measured gamma decay of this isomer [2], this work allowed to establish the complete decay pattern of this state, which is needed for detailed studies [3] of the isospin symmetry breaking in the region of doubly-magic ^{56}Ni .

This study illustrates challenging works on both the experimental and theoretical sides. The unusual high angular momenta, $\ell = 5$ and $\ell = 7$, for the proton emission branches, requires a dedicated theoretical treatment due to extremely low spectroscopic factors. Because of the short half-life of the isomer, about 150 ns , the experimental measurement of the proton emission requires a time projection chamber to separate the proton signal from the ion signal. This experiment, the first of its kind, allowed for a 4D imaging of the proton radioactivity, *i.e.*, a direct measurement of the particles tracks and emission time.

[1] J. Giovinazzo *et al.*, *Nature Comm.* 12, 4085 (2021)

[2] D. Rudolph *et al.*, *Phys. Rev. C* 78, 021301(R) (2008)

[3] D. Rudolph *et al.*, *Phys. Lett. B*, in press