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Searching for the microscopic origin of shape coexistence in Ca isotopes

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Nuclear shape coexistence plays a crucial role in understanding the microscopic origin of nuclear deformation. The Ca isotopic chain between ^{40}Ca and ^{48}Ca is an optimal test area that can provide key information on shape coexistence when moving from the valley of stability towards the neutron-rich region of the Segrè chart.
This work aims to perform complete low-spin spectroscopy of ^{42,43,44,45}Ca isotopes, complementary to the already existing data of ^{41,47,49}Ca, and to look for evidence of shape coexistence in the A$\sim$ 40 region.
As a first step in this direction, we focused on ^{42}Ca, where evidence for a 0^+ excitation associated with a superdeformed shape has been obtained in a Coulomb excitation experiment.
The ^{42}Ca nucleus of interest was populated with a (n_{th}, γ) reaction on a ^{41}Ca radioactive target.
The γ cascades emitted from the 11.480 MeV capture state were detected using the 32 HPGe crystals array FIPPS, at ILL (Grenoble).
The result of this work is a complex level scheme that will be presented together with preliminary angular correlation studies made to establish spin and parities of several excited states of ^{42}Ca.

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