# Search for shape coexistence in Ca isotopes by complete low-spin spectroscopy via ($n_{th}$,$\gamma$) reactions

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Ca isotopes in the A∼40 mass region, lying between the N=20 and N=28 shell closures, are ideal cases to study the evolution of nuclear structure from symmetric to neutron-rich systems. In these nuclei, phenomena like shape coexistence are expected to appear going towards the neutron-rich part of the nuclear chart [1-3]. Their study is essential for understanding the microscopic origin of nuclear deformation [4-7]. The objective of this work is to carry out a complete low-spin spectroscopic study of even-even $^{42,44}$Ca and odd-even $^{43,45}$Ca isotopes and, together with the already published results on $^{41,47,49}$Ca [8], track the evolution of nuclear structure along Z=20. All four isotopes relevant to this work were populated by ($n_{th}$,$\gamma$), neutron capture reactions exploiting thermal neutrons coming from the ILL (Grenoble) nuclear reactor. $\gamma$-rays de-exciting the nuclei of interest, populated at the capture state, were detected by the FIPPS HPGe array [9]. $\gamma$-$\gamma$ coincidence techniques were used to establish the decay schemes, resulting in 10 and 14 new levels and 109 and 180 new $\gamma$ rays in $^{42}$Ca and $^{44}$Ca, respectively. In this presentation, the population of $0^+$ excited states, possibly associated with shape coexistence, will be discussed. Moreover, preliminary angular correlation studies to pin down the spins and parities of several excited states of $^{42}$Ca and $^{44}$Ca nuclei will also be presented.

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