Contribution ID: **198** Type: **Oral Presentation**

Experimental Study of Low-Spin States in ^{42}Ca and ^{44}Ca as a Probe for Shape Coexistence

Nuclear shape coexistence is essential for exploring the microscopic origins of nuclear deformation [1-4].
The Ca isotopic chain between the two shell closures at N=20 and N=28 is an optimal test
area that can provide key insights into this phenomenon [5-7].
The aim of this work is to perform complete low-spin spectroscopy of even-even ^{42,44}Ca and odd-even ^{43,45}Ca isotopes, complementary to the already existing data on ^{41,47,49}Ca, and to search for evidences of shape coexistence phenomena in the $A \sim 40$ region.
As a first step, we focused on the two even-even cases of the isotopic chain, where the presence of 0^+ excitations associated with deformed and superdeformed structures have already been demonstrated [8,9].
Both ^{42}Ca and ^{44}Ca nuclei were populated with a (n_{th}, γ) reaction on two $CaCo_3$ targets, the first one being enriched with the ^{41}Ca radioactive isotope.
In both cases, the γ cascades emitted from the S_n capture states were detected using the 32 HPGe crystals array FIPPS [10], at ILL (Grenoble).
The results of this work are complex level schemes that will be presented together with preliminary angular correlation studies made to establish the spin and parities of several excited states of ^{42}Ca and ^{44}Ca nuclei.

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Authors: Prof. FORNAL, Bogdan (IFJ PAN); Dr UR, Calin (ELI-NP); MICHELAGNOLI, Caterina (Institut Laue-Langevin); Dr MIHAI, Constantin (IFIN-HH); ISKRA, Lukasz (Institute of Nuclear Physics PAN); LUCIANI, Massimiliano (INF Sezione di Milano, Università degli Studi di Milano); Dr JENTSCHEL, Michael (ILL); CIEPLICKA-ORYNCZAK, Natalia (Institute of Nuclear Physics Polish Academy of Sciences); MARGINEAN, Nicolae Marius Marginean (IFIN-HH Bucharest); Dr MUTTI, Paolo (ILL); LEONI, Silvia (University of Milano and INFFN Milano); BOTTONI, Simone (Università degli Studi di Milano and INFN Milano); Dr PASCU, Sorin (IFIN-HH); KÖSTER, Ulli (Institut Laue-Langevin, Grenoble)

Presenter: LUCIANI, Massimiliano (INF Sezione di Milano, Università degli Studi di Milano)

Session Classification: Parallel session

Track Classification: Nuclear Structure, Spectroscopy and Dynamics