

# Searching for Pygmy Quadrupole Resonance States in $^{118}\text{Sn}$ Using Neutron Capture at the Institut Laue-Langevin

## Contenu

The tin isotopic chain with its magic 50 proton closed shell is a benchmark for models of nuclear structure. While the neutron-rich tin nuclei around the magic 82 neutron shell play an important role in the rapid-capture nuclear process, the mid-shell region of the tin isotopes can display collective phenomena known as shape coexistence [1]; for example in  $^{116}\text{Sn}$  deformed bands based on 2 particle – 2 hole excitations across the proton 50 shell gap exist [2]. Furthermore, at energies below the particle threshold, a new phenomenon called Pygmy Quadrupole Resonance (PQR) have been recently observed in  $^{124}\text{Sn}$  below 5 MeV [3]. Coupled with theoretical calculations, the new excitation mode was interpreted as a quadrupole-type oscillation of the neutron skin. This study prompted investigations for corresponding states in the neighbouring  $^{116,118,120}\text{Sn}$  nuclei populated using thermal neutron capture of  $^{115,117,119}\text{Sn}(n,g)$ .

Thermal neutron capture of  $^{115,117,119}\text{Sn}$  populates compound capture states at the neutron separation energy of about 9 MeV. The capture states in these experiments consist of  $0^+$  and  $1^+$  spins, ideal for populating subsequent  $2^+$  states which could be attributed to the PQR predicted to exist in the 3-5 MeV range.

In the experiments performed at the Institut Laue-Langevin in Grenoble, France, a continuous high-flux of thermal neutrons of  $108 \text{ s}^{-1} \text{ cm}^{-2}$  from the 57 MW research reactor was used for capture reactions on enriched odd-A Sn targets. Gamma ray transitions from excited states in nuclei of interest were detected by the Fission Product Prompt gamma-ray Spectrometer (FIPPS) [4] consisting of eight large n-type high purity germanium (HPGe) clover detectors and augmented with eight additional Compton-suppressed HPGe clovers from INFN Horia Hulubei, in Bucharest, Romania for enhanced gamma-ray efficiency and additional angular coverage used to produce angular correlations for spin assignments.

Preliminary results from the  $^{117}\text{Sn}(n,g)^{118}\text{Sn}$  experiment will be presented highlighting the newly-observed levels within the 3-5 MeV energy range of interest for PQR.

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## Commentaires:

On behalf of the ILL collaboration

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