



Contribution ID: 64

Type: Poster

Lifetime of the $7(-)$ isomeric state of the odd-odd nucleus ^{68}Ga

Isomeric nuclear states are nuclear states which decays with long lifetimes ($T_{1/2} > 10$ ns) and generally reveals, a big change in angular momentum in its decay, a small matrix element or a small transition energy. By measuring lifetimes of isomeric states it's possible to obtain information about this state wave function, being a robust test for nuclear models. There are several gamma-ray spectroscopy techniques to measure lifetimes; in this work a system developed in Laboratório Aberto de Física Nuclear (LAFN) of University of São Paulo called SISTEMA para Medida de Estados Isoméricos (SISMEI) was utilized. This system utilizes delayed coincidence between evaporated particles in a nuclear reaction and the delayed gamma-rays emitted from the isomeric state to measure lifetimes. SISMEI is composed by plastic scintillators for particle detection, hiperpure germanium detectors (HPGe) and sodium iodide (NaI(Tl)) for gamma-ray detection, coupled to a coincidence electronic system, located at Pelletron (8UD) accelerator - LAFN. In the present work, an experiment to measure the $7(-)$ ($E = 1229.87(4)$ keV) isomeric state of ^{68}Ga was performed. The nuclear structure of this nucleus was calculated with the Large Scale Shell Model by using two different interactions and the results was compared with the known values. The experiment took about 80 hours with an event rate of about 8×10^4 counts per second.

The obtained value was $T_{1/2} = 60.8$ (11) ns with the HPGe detector, and $T_{1/2} = 60.83$ (25) ns with the NaI, which are both compatible, but more accurate, with experimental results of other authors.

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