

## NEUTRON CAPTURE AND BURN-UP CROSS SECTIONS WITH A HIGH SPIN K-ISOMERIC TARGET OF $^{177\text{m}}\text{Lu}$ : EVIDENCE FOR NEUTRON SUPER-ELASTIC SCATTERING

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Thanks to high spin isomeric targets, it is possible to investigate many topics of current interest in nuclear physics [i] [ii] [iii] [iv]. These studies can improve our understanding of the models of nuclear reactions. Here, I will report on the measurement of super-elastic scattering on  $^{177}\text{Lu}^{\text{m}}$ . The neutron super-elastic scattering, also called neutron inelastic acceleration [v,vi], occurs in the neutron collisions with excited nuclear level. In this reaction, the nucleus could partly transfer its excitation energy to a scattered neutron.

I will present the method to produce such targets of  $^{177}\text{Lu}^{\text{m}}$ , K-isomer  $J^{\pi}=23/2^-$  and  $T_{1/2} = 160.44$  days. Next, I will detail the measurement of the  $^{177}\text{Lu}^{\text{m}}$  neutron super-elastic scattering cross section by an indirect method. This approach involves two measurements in the same thermal neutron flux. The first measurement gives the isomer burn-up cross section while the second involves a determination of the isomer capture cross section. The difference between these two cross sections shows the existence of  $^{177}\text{Lu}^{\text{m}}$  de-excitation via (n,n') super-elastic scattering. The high cross section of the latter allows us to contemplate a direct observation of accelerated neutrons. We will highlight experimental possibilities of under taking such a direct measurement.

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[v] I.A. Kondurov *et al.*, JETP Lett. 31 (1980) 20

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