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Low-energy enhancement of nuclear γ strength and its impact on astrophysical reaction rates

A.C. Larsen[1], A. Bürger[1], T. K. Eriksen[1],S. Goriely[2], M. Guttormsen[1], A. Görgen[1], T. W. Hagen[1], S. Harissopulos[3], H.T. Nyhus[1], T. Renstrøm[1], S. Rose[1], I. E. Ruud[1], A. Schiller[4], S. Siem[1], G.M. Tveten[1], and A. Voinov[4]

[1] *Department of Physics, University of Oslo, N-0316 Oslo, Norway*
[2] *Institut d'Astronomie et d'Astrophysique, ULB, Belgium*
[3] *Institute of Nuclear Physics, NCSR "Demokritos", Athens, Greece*
[4] *Department of Physics and Astronomy, Ohio University, Athens, Ohio 45701, USA*

Contact email: *a.c.larsen@fys.uio.no*

An unexpected enhancement in the low-energy part of the gamma strength function for medium-mass and light nuclei has been discovered at OCL [1, 2, 3]. This enhancement could lead to an increase in the neutron-capture rates up to two orders of magnitude for very exotic, neutron-rich nuclei (see Fig. 1 and Ref. [4]).

The existence of this enhancement has very recently been confirmed in ^{95}Mo in an experiment at Lawrence Berkeley National Laboratory [5]. However, the nature of the enhancement is not known, and there is still an open question whether this structure persists when approaching the neutron drip line.

In this talk, the present status of the low-energy increase will be discussed. Fresh data on Cd and Fe isotopes will be presented. For the latter, data taken with large-volume $LaBr_3$(Ce) crystals borrowed from the INFN-Milano group will also be showed. Calculations of reaction rates and the possible impact on the stellar r-process will also be discussed.

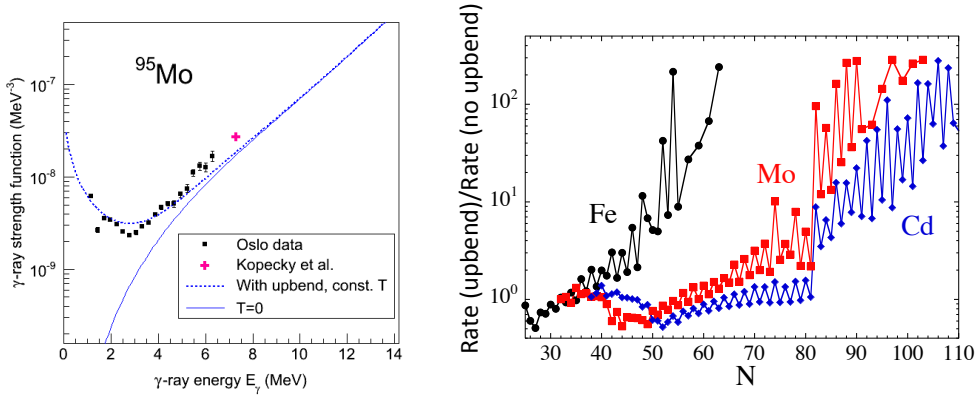

Figure 1: *Left: Oslo data of the γ-strength function of ^{95}Mo (black squares, from Ref. [2]), and models of the strength assuming zero temperature (solid, blue line) and with a constant temperature, including also a parameterization of the upbend (dashed line). Right: Ratios of (n,γ) reaction rates at $T = 1 \cdot 10^9$ K, with and without the upbend in the γ strength, for Fe, Mo, and Cd isotopes approaching the neutron drip line. See Ref. [4] for details.*

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