Gamma-ray strength functions and their relation to astrophysics*

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One of the most challenging topics within nuclear astrophysics today is the description of the observed element abundances in our solar system and the universe. The reaction mechanisms that are called for to describe the stellar nucleosynthesis include rapid neutron capture, slow neutron capture, and photodisintegration. However, as of today, the scientific community is far from having a complete picture of the nucleosynthesis. One reason for this is that the astrophysical site for the rapid neutron capture process is still not firmly established; another is due to the wealth of required nuclear information.

Two indispensable quantities that enter the reaction codes are the nuclear level density and the γ-ray strength function, where the latter one is particularly important for neutron-capture cross sections. The γ-ray strength function gives information on the average electromagnetic decay properties of the nucleus, and is dominated by the Giant Electric Dipole Resonance (GEDR). However, soft resonances in the γ-ray strength function close to the neutron threshold may have a large impact on the neutron-capture cross sections and consequently on the astrophysical reaction rates relevant for the r-process [1,2].

Experimental data on γ-ray strength functions measured at the Oslo Cyclotron Laboratory (OCL) will be presented, as well as calculated neutron-capture cross sections for some key cases where the input model for the γ-ray strength function is modified to fit the data. Also the impact on the astrophysical rates will be demonstrated.

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[1] S. Goriely, Phys. Lett. **B436**, 10 (1998).

[2] A. C. Larsen and S. Goriely, submitted to Phys. Rev. C.