Contribution ID: **176** Type: **Poster**

Dipole strength in the well-deformed nucleus ^{154}Sm in the Pygmy Resonance energy-region via (γ, γ') reactions

Monday 16 September 2024 20:15 (20 minutes)

The E1 γ-ray strengh of the Pygmy Dipole Resonance (PDR), close to the neutron threshold on the top of the low-energy tail of the Isovector Giant Dipole Resonance (IVGDR), exhausting only few percent of the TRK sum rule is known to affect significantly the radiative neutron capture cross section calculations of the astrophysical r-process [1] which is responsible for the nucleosynthesis of heavy neutron-rich nuclei in the universe.

So far, the PDR strength distribution has been measured in several neutron-rich nuclei [2,3], mostly on or near neutron shell closures, where the shape is (quasi) spherical. The systematic summed strengths in an isotopic and isotonic chains of the nuclear chart, seems to be linked to the neutron excess.

Although described in various microscopic and hydrodynamic theoretical models as oscillations of the neutron excess against an isospin neutral core, the nuclear structure (collective and/or singular character) of the PDR states and the strength fragmentation are still controverse.

The corresponding neutron-skin size, related to the (a)symmetry energy term is an important ingredient for the equation of state modeling the neutron stars.

Since the rised interest of the PDR strength as well from astrophysical as nuclear structure point of view and in order to complement our experimental database, one need to explore the case of deformed shapes where such information is limited to only a very few cases, as for ^{156}Gd [4] and ^{164}Dy [5]. In this talk, I will present our recent results on the well-deformed ^{154}Sm ($\beta = 0.34$) which we investigated via the ^{154}Sm(γ, γ') reactions up to the neutron-separation threshold $S_n = 7.97\,\mathrm{MeV}$, using the bremsstrahlung facility [6] at ELBE supra-conductor accelerator of the Helmholtz-Zentrum Dresden-Rossendorf (HZDR), Germany, producing an electron beam of energy of $9.5\,\mathrm{MeV}$. An evidence for PDR strength have been observed which will be compared to the spherical isotope ^{144}Sm at $N = 82$ closed neutron shell and to the ^{156}Gd isotone.

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Session Classification: Poster Session