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Studying Low-Lying E1 Strength & Neutron Capture Rates in A≈50 Nuclei via (d,p) and (d,pγ) experiments at FSU

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We have started an experimental program at Florida State University's John D. Fox Superconducting Accelerator Laboratory to study the single-particle structure of the Pygmy Dipole Resonance (PDR) and to inform models that use (d,pγ) as a surrogate reaction for (n,γ) neutron capture. In our program, we focus on fp-sd shell nuclei as Inakura et al. predicted a significant strength increase of the PDR beyond N=28 and connected it to a specific nuclear structure effect. The same E1 strength increase is expected at N=50, which could directly influence (n,γ) rates at the beginning of the r process path. We, therefore, chose to study the microscopic structure of the PDR around N=28 as these nuclei are accessible for detailed stable beam (d,p) experiments. In addition, we recently commissioned the CeBrA (Cerium Bromide Array) demonstrator, which can be used to perform (d,pγ) experiments at the SE-SPS (Super-Enge Split-Pole Spectrograph). In this talk, I will report initial results of our (d,p) and (d,pγ) experiments on the even-even 48,50Ti and 62Ni nuclei, as well as usefulness of particle-gamma coincidences, with emphasis on how to constrain (n,γ) rates from surrogate (d,pγ) reactions.

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