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Photon strength functions from (p, γ) reactions

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In the 1970s and 80s (p, γ) reactions were successfully utilized to measure the photon strength function (PSF) using the Average Resonance Capture Method [1] and this work seeks to explore these reactions to measure the PSF using the ratio and X2 method [2]. The $^{50}\text{Cr}(p, \gamma)^{51}\text{Mn}$ capture reaction has been used to study primary γ -ray transitions from the entry states between the proton and neutron separation energies to discrete states of known spins and parities. For a proof-of-principle experiment, the Tandatron accelerator at iThemba LABS was used to deliver proton beams of 2.5 to 3 MeV and 3.675 to 4.498 MeV in intervals of 20-25 keV with beam currents of up to 5 nA. The primary γ -rays emitted from the reaction were detected using one segmented Clover detector placed at 90° to the beam direction. A total of 64 gamma-ray spectra were collected with 26 and 38 of these spectra collected for 2.5 to 3 MeV and 3.675 to 4.498 MeV beam energies respectively. The level scheme of the ^{51}Mn compound nucleus was built with several new transitions and states being identified. The average intensities of the primary γ -rays decaying to discrete states of known spin and parity were extracted. The PSF of ^{51}Mn will be extracted using the ratio and X2 method [2]. In this talk, I will present the analysis and preliminary results on the extraction of the PSF of ^{51}Mn populated using $^{50}\text{Cr}(p, \gamma)$ reaction.

Primary author: Mr NETSHIYA, Adivhaho (iThemba LABS and WITS)

Presenter: Mr NETSHIYA, Adivhaho (iThemba LABS and WITS)

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