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Extracting spectroscopic factors from direct reactions

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Direct reactions have been used to probe the structure of the nucleus for decades. After some decline in the 80's and 90's these methods have more recently had a surge in popularity, and new techniques have been added to the experimentalists toolbox. One goal of direct reaction experiments is to extract spectroscopic factors (SFs), related to the shell occupancy. SFs extracted from neutron knockout reactions show reductions, compared to the theoretical value, that are related to the neutron separation energy [1], whereas SFs from the well-established (e,e'p) reaction on stable nuclei are consistently 50% - 60% lower than those expected from the independent-particle shell model [2] over a wide range of masses. \pardAs the extraction of spectroscopic factors from direct reaction measurements requires the comparison of data with calculated differential cross sections, the results are by nature model dependent. The influence of different scattering (commonly optical), and bound state potentials, should not be over-looked. Recent attempts to reanalyze single-neutron transfer data using a consistent approach have shown agreement with large basis shell model calculations [3], clearly conflicting with both the (e,e'p) and the knockout data. It has been suggested that the Asymptotic Normalization Coefficient (ANC) is a more valid quantity to extract when the reaction is peripheral [4]. spectroscopic factors are, how they are extracted and what they really mean will be discussed in this talk.

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