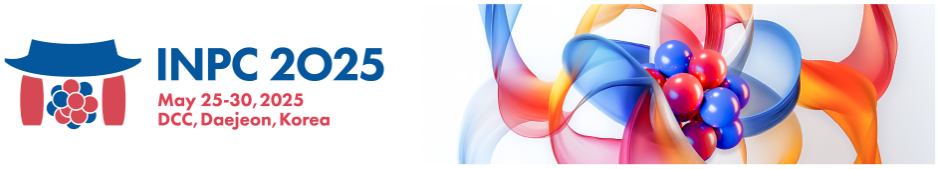

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The 36S(p,d)35S reaction: new results from an old tool

Friday, 30 May 2025 08:30 (25 minutes)

The neutron-removal reaction ^{36}S$(p, d)^{35}$S was studied at iThemba LABS up to an excitation energy of E$_x$ = 16 MeV to investigate the effectiveness of the $N = 20$ shell closure and examine the neutron $d_{5/2} - d_{3/2}$ spin-orbit splitting in ^{36}S. An unexpected and pronounced j-dependence of the cross-section angular distributions at forward angles enabled the study of spin-orbit splitting using cross section measurements alone.

The results indicate that the splitting between the reconstructed $d_{5/2}$ and $d_{3/2}$ single-particle spin-orbit partners increases from ^{36}S to ^{40}Ca, contrary to the generally observed trend predicting a decrease of approximately ∼450 keV. This atypical splitting offers a valuable test case for exploring the role of the tensor force, particularly because the neutron-proton tensor force counterbalances the spin-orbit force as protons occupy the $1d_{3/2}$ orbital. These findings provide critical data to constrain state-of-the-art theoretical models, especially in evaluating the proton-neutron tensor component's impact.

Primary author: NEVELING, Retief (iThemba LABS)

Co-authors: LEMASSON, A. (GANIL); Dr AAVA, Abraham (TRIUMF); YUAN, Cenxi (Sun Yat Sen University); AZAIEZ, Faical (LNL-INFN); FLAVIGNY, Freddy (LPC Caen); Prof. NOWACKI, Frédéric (Université de Strasbourg); Prof. EBRAN, Jeanpaul (Université Paris-Saclay, CEA); Dr MALATJI, Kgashane (iThemba LABS); Dr DONALDSON, Lindsay (iThemba LABS); PELLEGRI, Luna (University of the Witwatersrand and iThemba LABS); WIEDEKING, M. (Lawrence Berkley National Laboratory); Dr KEELEY, Nicholas (National Centre for Nuclear Research); SORLIN, Olivier (GANIL); JONES, Pete (iThemba LABS); Prof. ADSLEY, Philip (Texas A&M University); Dr JONGILE, Sandile (iThemba LABS); Ms MTHEMBU, Sinegugu (University of the Western Cape); Prof. DUGUET, Thomas (KU Leuven); Dr KHUMALO, Thuthukile (iThemba LABS); Prof. SOMA, Vittorio (IRFU, CEA)

Presenter: NEVELING, Retief (iThemba LABS)

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