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Search for *E*0 transitions in ⁵⁴Mn via electron-pair spectroscopy

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The low energy structure of nuclei close to the doubly magic ⁴⁰Ca and ⁵⁶Ni are driven by collective excitations, including shape coexistence and super-deformation [1]. On the other hand, the N=28 shell closure is also strongly influencing the nuclei between N=Z=20 and 28. Electric monopole, *E*0 transitions are often cited as excellent probes to explore the interactions of collective excitations with different deformations. Strong *E*0 transitions are reported in ⁵⁴Fe [2] and in ⁵²Cr [3], however most of the *E*0 transitions in the region has not been observed. We shall report on a detailed conversion electron and electron-positron pair conversion study of ⁵⁴Mn, a N=29, Z=25 nucleus next to ⁵²Cr and ⁵⁴Fe. Excited states up to about 3 MeV energy have been populated using the ⁵⁴Cr(p,n)⁵⁴Mn reaction at 5.4 MeV bombarding energy at the ANU HIAS accelerator. Electron and electron-positron pair conversion coefficients have been measured with the Super-e spectrometer [4]. The 1579 keV transition from the 1634 keV 2⁺ state has a conversion coefficient larger than the pure *M*1 or *E*2 value, indicating a significant *E*0 contribution. In this talk we describe the experiments and will present a preliminary interpretation of the results.

K. Hyde and J.L. Wood, Rev. Mod. Phys. 83 (2011) 1467
T.K. Eriksen, PhD thesis, ANU (2018)
J.T.H. Dowie, PhD thesis, ANU (2021)

[4] T.K. Eriksen et al., Phys. Rev. C 102 (2020) 024320

Primary author: AVAA, Abraham (iThemba/Wits)

Co-authors: KIBEDI, Tibor (Department of Nuclear Physics, Australian National Laboratory); JONES, Pete (iThemba LABS); USMAN, Iyabo (University of the Witwatersrand); CHISAPI, Maluba Vernon J. (iThemba LABS/Stellenbosch University); Prof. STUCHBERY, Andrew (ANU); Mr DOWIE, Jackson (ANU)

Presenter: AVAA, Abraham (iThemba/Wits)

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