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Search for $E0$ transitions in ^{54}Mn via electron-pair spectroscopy

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The low energy structure of nuclei close to the doubly magic ^{40}Ca and ^{56}Ni 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, $E0$ transitions are often cited as excellent probes to explore the interactions of collective excitations with different deformations. Strong $E0$ transitions are reported in ^{54}Fe [2] and in ^{52}Cr [3], however most of the $E0$ transitions in the region has not been observed. We shall report on a detailed conversion electron and electron-positron pair conversion study of ^{54}Mn, a N=29, Z=25 nucleus next to ^{52}Cr and ^{54}Fe. Excited states up to about 3 MeV energy have been populated using the ^{54}Cr(p,n)^{54}Mn 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 $M1$ or $E2$ value, indicating a significant $E0$ contribution. In this talk we describe the experiments and will present a preliminary interpretation of the results.

[1] K. Hyde and J.L. Wood, Rev. Mod. Phys. 83 (2011) 1467
[2] T.K. Eriksen, PhD thesis, ANU (2018)
[3] J.T.H. Dowie, PhD thesis, ANU (2021)
[4] T.K. Eriksen et al., Phys. Rev. C 102 (2020) 024320

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