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Cross-shell configurations in ^{38}Cl structure and the quest for a new shell model interaction. REBEKA SULTANA LUBNA, KONSTANTINOS KRAVVARIS, SAMUEL TABOR, VANDANA TRIPATHI, ALEXANDER VOLYA, ELIZABETH RUBINO, Florida State University, JAMES ALLMOND, Oak Ridge National Laboratory, BRITTANY ABROMEIT, LAGY BABY, THAXTER HENSLEY, Florida State University — ^{38}Cl with Z = 17 and N = 21 has long been recognized as providing a window into the interactions between $\pi 0d_{3/2}$ and $\nu f_{7/2}$ nucleons. The availability of a ^{14}C beam to occur a fusion evaporation reaction in conjunction with the γ-detector array at the John. D. Fox laboratory has allowed further exploration of the higher-spin structure of ^{38}Cl to elucidate the role of excitations across the N = 20 shell gap. Comparison with microscopic structure models has proved very fruitful in the past in interpreting level schemes, but were limited by the need to adjust the N = 20 shell gap for cross-shell excitations for different nuclei. Therefore, we developed a microscopic effective interaction based on fitting the shell model cross-shell interaction matrix elements over a wide range of particle-hole states in nuclei across the *sd* shell and beyond. The main focus was to tune the monopole terms across the shell gaps, N = 8 and N =20. The valence space of the new FSU interaction comprises the *spsdpf* model space, compatible to the normal and intruder states of the *sd* shell isotopes. The shell model calculations using FSU interaction have been performed in this work to better understand the structure of ^{38}Cl and some nearby even A Cl isotopes.

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