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Neutron knockout on beams of Sn-106,108 and Cd-106

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Characterizing the nature of single-particle states outside of double shell closures is essential to a fundamental understanding of nuclear structure. This is especially true for those doubly magic nuclei that lie far from stability and where the shell closures influence nucleosynthetic pathways. The region around Sn-100 is one of the most important due to the proximity of the N=Z=50 magic numbers, the proton-drip line, and the end of the rp-process. However, owing to the low production rates, there is a lack of spectroscopic information and no firm spin-parity assignment for isotopes close to Sn-100. Neutron knockout reaction experiments on beams of Sn-106,108 and Cd-106 have been performed at the NSCL. By measuring gamma rays in CAESAR and momentum distributions from reaction residues in the S800, the spin-parity of ground state and first excited state for Sn-105,107 have been found, constituting the first measurement of the spin-parity for odd-mass tin isotopes lighter than Sn-109. The results also show a high degree of mixing in the ground states of the isotopes Sn-106,108 between the d5/2 and g7/2 single particle-states and they are compared to reaction calculations. For the Cd-106 beam single-,double-, and triple-neutron knockout reactions have been observed. For Cd-105 the spin-parity is already known, therefore, the measurement of the momentum distributions of the ground and first excited states of this residue is an important validation of the technique used for the light tin isotopes.

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