# Direct reactions with neutron-rich and neutron-deficient tin beams

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The structure of exotic tin nuclei close to the shell closures at $N = 50$ and $N = 82$ is important to the characterization of models away from the valley of stability. Knockout reactions pushing toward $^{101}$Sn and neutron-transfer reactions on nuclei around $^{132}$Sn are probing this structure in ways that selectively populate single-particle-like states.

The nucleus $^{132}$Sn is of interest due to the vicinity of the $Z = 50$ and $N = 82$ shell closures and the *r*-process nucleosynthetic path. Four states in $^{131}$Sn with a strong single-particle-like component were previously studied via the (d,p) reaction, with limited excitation energy resolution. The $^{130}$Sn($^{9}$Be,$^{8}$Be)$^{131}$Sn and $^{130}$Sn($^{13}$C,$^{12}$C)$^{131}$Sn single-neutron transfer reactions were performed in inverse kinematics at the Holifield Radioactive Ion Beam Facility using particle-$\gamma$ coincidence spectroscopy.

Results will be presented relating to the energies and $J^{\pi}$ assignments for the previously measured 1p-2h states and their implication for neutron transfer relevant to the astrophysical r-process. Transfer on the isomeric component of the $^{130}$Sn beam was apparent through decays from high-spin states in $^{131}$Sn. This is the first measurement of transfer on an isomer in the $^{132}$Sn region [1].

At the other end of the tin isotopic chain, $^{100}$Sn is the heaviest self-conjugate nucleus. Its vicinity to the proton dripline, its exceptional allowed $\beta$-decay strength, and its location at the end of a region of enhanced $\alpha$-decays all distinguish $^{100}$Sn as a key nucleus. Building upon our past experiment studying the structure of $^{107}$Sn at the NSCL [2], an experiment to study the structure of $^{105}$Sn via neutron knockout from a $^{106}$Sn beam was performed at FRIB. Data from this early FRIB experiment will be presented.

[1] K.L. Jones, *et al.*, Phys. Rev. C **105**, 024602 (2022).

[2] G. Cerizza et al. Phys. Rev. C **93**, 0221601 (R) (2016).

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