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# Transfer reactions on high-spin nuclear isomers

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The use of isomer beams has potential to probe aspects of nuclear structure which are otherwise inaccessible from reactions with beams of nuclei in their ground state. For example, studies of the single-particle component of high-spin states, as well as studies on how core excitations affect nuclear structure can be carried out via transfer reactions in inverse kinematics on high-spin isomer beams. In order to demonstrate the feasibility of this technique, we have performed an experiment to populate high-spin states in $^{19}$F via the (*d*,*p*) neutron-transfer reaction on an isomer beam of $^{18}$F. The $^{18}$F beam was produced at the Argonne Tandem Linac Accelerator System using the in-flight technique. The resulting $^{18}$F beam consists of a mixture of the $5^+$ isomer and the $1^+$ ground state. The $^{18}$F beam was transported to the HELIOS spectrometer, which was used to analyze outgoing protons following the (*d*,*p*) reaction on the ground state and $5^+$ isomer of $^{18}$F. The reconstructed excitation energy spectrum of $^{19}$F indicates direct population of the $13/2^+$ state which, in this case, can only be reached from reactions with the isomer component of the beam. Preliminary results suggest the $13/2^+$ is the terminating state of the ground-state rotational band of $^{19}$F.

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