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Rotational Cooling in a Time-Reversal Symmetry Violation Molecular Beam Experiment KONRAD WENZ, MICHAEL AITKEN, Columbia University, OLIVIER GRASDIJK, JAKOB KASTELIC, OSKARI TIMGREN, Yale University, TRISTAN WINICK, University of Massachusetts Amherst, TREVOR WRIGHT, DAVID DEMILLE, Yale University, DAVID KAWALL, University of Massachusetts Amherst, STEVE LAMOREAUX, Yale University, TANYA ZELEVINSKY, Columbia University, CENTREX COLLABORATION — Our experiment is designed to search for time-reversal symmetry violation in a thallium nucleus by measuring its Schiff moment (SM) in thallium fluoride (TlF) molecules. Interrogating a cold molecular beam and manipulating quantum states of the molecule using optical and microwave transitions are the first steps that have to be undertaken in the experiment. A cold beam of TlF is acquired through a cryogenic buffer gas beam source where we ablate a solid TlF target in a neon-filled chamber and obtain molecules with a rotational temperature of 7K. In order to measure SM with high precision, we need to first bring as many molecules as possible to a single quantum state. After assembling the first portion of the setup, we characterized the molecular beam and performed spectroscopic measurements of TlF using a frequency-stabilized ultraviolet laser. Here, we present results of the first major part of the experiment - rotational cooling. This procedure allows us to bring the majority of molecules to a single hyperfine Zeeman sublevel in the ground rotational state manifold with the use of a single laser and a pair of microwave beams.

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