A SEARCH FOR TIME-REVERSAL SYMMETRY VIOLATION WITH THALLIUM FLUORIDE

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The Cold molecule Nuclear Time-Reversal EXperiment (CeNTREX) aims to look for the fundamental time-reversal (T) symmetry violations in the hadronic sector. Violation of T symmetry is a necessary condition to dynamically generate the asymmetry in matter and anti-matter we observe in the universe. Many extensions of the standard model imply additional sources of T-violation larger than the standard model prediction. CeNTREX utilizes Ramsey interferometry on cryogenic beam of thallium fluoride (TlF) molecules to look for shifts in nuclear magnetic resonance frequencies in ^{205}Tl nucleus when it is electrically polarized. To increase sensitivity, CeNTREX employs lasers, microwaves and electric fields to prepare and manipulate molecular quantum states. Laser-induced fluorescence readout of TlF then provides information on T-violating phase acquired during the Ramsey interferometry. We project significant improvements in the experimental upper bounds of various T-violating parameters. Here, we present on the motivation and progress of the experiment as well as the techniques involved.