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Experimental Study of Parity and Time-Reversal Symmetries in Polarized Epithermal Neutron Optics

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The parity violating effects in nuclear interactions is extremely enhanced in resonant neutron absorption processes via compound nuclear states for some of medium-heavy nuclei. The enhancement is explained as a result of the interference between parity-unfavored partial amplitudes of the compound nuclear process, which is referred to as "s-p mixing". The "s-p mixing" is expected to enhance the visibility of the effect of the breaking of both parity and time-reversal symmetry (P-odd T-odd). Based on these considerations, an experimental approach to search for the P-odd T-odd effects to activate a novel type of new physics search beyond the standard model is in progress using the pulsed neutron beam from the pulsed spallation neutron source of Japan Proton Accelerator Research Complex (J-PARC) under the collaboration "Neutron Optical Parity and Time-Reversal Experiment (NOPTREX)" as the program number J-PARC E99. P-odd T-odd effects will be studied in neutron optics in which fake T-violating effects can be controlled, with the enhanced sensitivity biased to chromo-EDM. We discuss the studies of the "s-p mixing" in 139La(n, γ)140La and the plan of T-violation search with polarized lanthanum target.

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