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New Search for Mirror Neutrons at HFIR

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The theory of “mirror matter” predicts a hidden sector made up of a copy of the Standard Model particles and interactions but with opposite Parity. If mirror matter interacts with ordinary matter, there would be experimentally accessible implications in the form of neutral particle oscillations. Direct searches for neutron oscillations into mirror neutrons in a controlled magnetic field have previously been performed using ultracold neutrons in storage/disappearance measurements, with some inconclusive results for oscillation times of $T \sim 10$ s. We will describe a proposed disappearance and regeneration experiment in which the neutron oscillates to and from a mirror neutron state. This experiment will be performed using the existing GP-SANS instrument at the High Flux Isotope Reactor at Oak Ridge National Laboratory with modest modifications, and could have the sensitivity to exclude up to $T < 15$ s.

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