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Analysis results of the search for neutron to mirror-neutron oscillations at PSI

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Mirror matter was initially proposed as a possible fix of parity violation in the weak interaction on a global scale[1]. More in general, mirror matter and mirror neutrons in particular could help explain baryon number violation and are viable candidates for dark matter[2].

The mirror-neutron experiment at PSI was a storage measurement, designed to search for anomalous disappearances of ultracold neutrons in the presence of a controlled non-zero magnetic field[3]. The experiment completed operation 2021 and tested a mirror magnetic field from about $5 \mu\text{T}$ to above $10 \mu\text{T}$, finding no evidence for anomalous neutron losses. We provide an in-depth look at the analysis based on Monte Carlo simulations and precise magnetic field maps and present new limits on the oscillation time.

[1] Lee, T.D.; Yang, C.-N., Phys. Rev. 1956, 104, 254–258.

[2] Bento, L.; Berezhiani, Fortsch. Phys. 2002, 50, 489–495.

[3] Ayres N J et al., Symmetry. 2022; 14(3): 503

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