Time-Reversal Invariance Violation in Neutron Nuclei Interactions at Spallation Neutron Sources

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New high flux Spallation Neutron Sources give the opportunity to search for Time-Reversal Invariance Violation (TRIV) in neutron scattering. There are two important advantages in a search TRIV in neutron nuclei interactions: the possibility of an enhancement of T-violating observables by many orders of magnitude [1], and the relatively large number of the nuclear targets, which provides the assurance of avoiding possible "accidental" cancelations of TRI-violating effects due to unknown structural factors related to the strong interactions. Taking into account that different models of the CP-violation may contribute differently to a particular T/CP-observable, which may have unknown theoretical uncertainties, TRIV nuclear effects could be considered as valuable complementary experiments to electric dipole moment (EDM) measurements. We will discuss the enhancement factors and compare nuclear TRIV effects with the values of neutron and nuclear EDMs [2]. This comparison shows that TRIV experiments at the Spallation Neutron Sources have great discovery potential and can improve the current limits on CP-violating interactions obtained from EDMs measurements by 2 – 4 orders of magnitude [3].

References

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