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Neutron electric dipole moment searches

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Observations show us that our Universe is matter dominated. Key to improving the understanding of this asymmetry between matter and antimatter (also referred to as the Baryon Asymmetry of the Universe BAU) are processes that involve CP-violation – that is the violation of the combined symmetries of charge conjugation (C) and parity transformation (P). The Standard Model (SM) of Particle Physics fails to explain the observed ratio between matter and antimatter by several orders of magnitude due to a lack of CP-violating processes. Thus, searches for those are very powerful beyond SM physics probes. A permanent non-zero electric dipole moment (EDM) of the free neutron violates P and time reversal (T) symmetry. T-violation is equivalent to the CP-violation, taking the CPT theorem for granted. This constitutes a strong link between the neutron EDM and one of the most pressing questions of contemporary fundamental physics research – solving the riddle of the BAU. In this presentation I will motivate why searches for a measurable neutron EDM are so impactful and yet so difficult. Subsequently, I will give an overview of the several different efforts around the globe to improve the sensitivity towards this elusive quantity and how the different collaborations tackle the intricacies of this high precision search.