



Wednesday

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Rm 118 NSH

Fundamental neutron physics: Nuclear and particle physics with slow neutrons

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The past five years have seen some important and challenging developments in the field of fundamental neutron physics, a field supporting a diverse collection of experiments probing aspects of nuclear and particle physics as well as providing the experimental realization of idealized quantum mechanical systems. Many of these experiments are motivated by the opportunity to search for Beyond Standard Model (BSM) physics, where slow neutrons can provide the most sensitive tools to conduct such a search. One of the driving forces behind the search for BSM physics is the belief that we need new physics to explain the cosmological matter-antimatter asymmetry, a phenomenon requiring both baryon-number violating and time-reversal symmetry violating interactions. The need for these symmetry-violating interactions has spurred a commitment over many decades for improving limits on the static electric dipole moment of the neutron and has also provided impetus for searches for neutron-antineutron oscillations. The European Spallation Source, now under construction in Sweden, provides the first significant opportunity in almost 30 years to improve our sensitivity to neutron oscillations, with roughly 3 orders of improvement in the sensitivity for anti-neutron appearance within reach. There has also been a rapid growth in searches for short-ranged forces which result from theories which explain the dark energy or from BSM physics modifying gravity at distance scales of roughly a millimeter and below. Here neutrons, being electrically neutral and massive, provide a unique probe for new physics through interferometry and scattering experiments, some performed for the first time quite recently. Finally, theoretical progress on the analysis of low energy decays has clarified the impact these measurements make on constraining BSM physics and sharpening the motivation to pursue new measurements. When taken together with the difference between the neutron lifetime from cold neutron beam and UCN storage experiments, there has been a remarkable growth in the activity and interest in neutron decay experiments. In this talk, we provide an overview of recent activity in the field, concentrating on some short-ranged interactions experiments, neutron beta decay and neutron-antineutron oscillations.