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FUNDAMENTAL PHYSICS WITH ULTRACOLD NEUTRONS

The knowledge of fundamental properties of the neutron helps us understand many aspect of the universe. CP violation might show up in a non-zero electric dipole moment (EDM) of the neutron, making EDM measurements the flagship of fundamental neutron physics.
Furthermore, 100 s after the Big Bang, the neutron lifetime influences e.g. the helium abundance in the Universe. Combined with other measurements, this determines coupling constants of the weak interaction, important for solar models and tests of the Standard Model. Its neutrality and long lifetime allow studies of their gravitational interactions, probing quantum mechanics of gravity, and constraining non-Newtonian gravity.
These experiments need very slow neutrons, called ultracold neutrons (UCN, ˜100 neV) and can be stored in traps via gravitational, strong and electromagnetic interaction.
I will introduce UCN, their production and some of the main experiments with special focus on the ultracold neutron facility at TRIUMF.

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