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Tests of the Standard Model of Particle Physics in Neutron Beta Decay

Thursday, 10 December 2020 10:00 (30 minutes)

Particle Physics with neutrons addresses a number of basic and often unique questions of particle physics and cosmology at very low energies. Within the Standard Model of particle physics, neutron beta decay data serves as important input e.g. to investigate the cosmological abundance of light elements and the energy production in the Sun. Searching for new physics, precision measurements allow to test the unitarity of the CKM quark-mixing matrix and to constrain new effective couplings, as well as exotic decay modes.

In this talk, I will present recent results obtained by the PERKEO group from experiments at the ILL and discuss their implications. The follow-up instrument PERC is currently under construction at the MLZ. Its key component is a 12m long superconducting magnet system, which contains an 8m long decay volume in a novel polarisation-preserving neutron guide. PERC aims to improve measurements of several decay correlations by an order of magnitude. I will discuss its design and status.

Finally, I will present the new neutron depth profiling instrument N4DP at the PGAA beam station of the MLZ, which is an excellent example of multi-disciplinary instrument development. Nuclear reactions allow probing depth profiles of certain nuclides like ${}^6\text{Li}$. The intense neutron beam, low backgrounds, and excellent energy resolution enable time-resolved in-operando studies of Li-ion batteries.

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