

The MuSun Experiment: or, how to have fun in rural Switzerland

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Muons can form so-called "muonic atoms" with nuclei which exhibit several exotic properties. In particular, all muonic atoms are subject to nuclear capture due to the weak interaction, which converts one of the protons into a neutron. This process depends on the behavior of protons and neutrons within the nucleus at an intermediate distance scale, and is thus a unique and sensitive tool for understanding the structure of nuclei. In this talk I will introduce the properties of muons and the phenomena of muonic atoms, and provide an overview of the MuSun experiment at the Paul Scherrer Institute. The experiment is designed to measure the rate of weak nuclear capture in heavy hydrogen, requiring a 10 part-per-million precision experimental uncertainty. The experiment utilizes a custom, ultra-high-purity time projection chamber which is used to construct the 3D trajectory of muons in the experiment. I will discuss the detector technology, novel experimental techniques, and large-scale data analysis needed to perform this challenging measurement.