Contribution ID: **55** Type: **not specified**

# The search for neutral currents in muonic X-rays

Muonic X-ray measurements at the Paul Scherrer Institute

Negative muons at rest quickly get captured by nearby atoms in highly exited atomic states. These muonic atoms subsequently de-exite via radiative and Auger transitions until the muon ends up in the 1s orbital. At the lower orbits, there is substantial overlap between the muon wave function and the nucleus, making this system an excellent laboratory to study the interaction between the muon and atomic nucleus.
MuX is a renewed effort at the Paul Scherrer to measure muonic X-rays in medium- and high-Z nuclei, fully exploiting the coverage and multiplicity of a germanium detector array and the high yield of negative muons available. The physics program focuses on atomic parity violation (APV). A measurement of the charge radius of 226Ra, derived from the 2s-1s transition energy, will serve as crucial input for an upcoming APV experiment with a single Ra ion. A second measurement program is exploring the possibility of measuring APV directly in muonic atoms. In the Standard Model, APV arrises from the mixing of the opposite parity 2p and 2s atomic states, leading to parity violation in the 2s-1s transition. We focus on Z=30 nuclei, where a measurable branching ratio of the single photon 2s-1s transition is expected. The high granularity of a large solid angle germanium detector array is exploited to suppress background from more intense transitions in the cascade. In the summer of 2017, we successfully commissioned a novel target for the 226Ra charge radius measurement, which is planned to run in 2018. In addition, 2 weeks of beam time were dedicated to observe the 2s-1s transition for the first time, and quantify the background.

**Primary author:** WAUTERS, Frederik (Johannes Gutenberg Universitaet Mainz)

**Presenter:** WAUTERS, Frederik (Johannes Gutenberg Universitaet Mainz)

**Session Classification:** Posters & welcome receiption