



Contribution ID: 48

Type: **not specified**

Mirror Matter in Positronium Decay Searches with the J-PET Detector

Tuesday 27 August 2024 17:30 (2 hours)

Positronium (Ps) atom, consisting of an electron and a positron bound together, represents a unique and intriguing system for fundamental physics research. This composite particle offers an exceptional opportunity for conducting precise tests, owing to its properties that are accurately described by Quantum Electrodynamics (QED) within the framework of the Standard Model (SM). Moreover, the decay processes of positronium, which can be modeled through Monte Carlo techniques, offer valuable insights into various aspects of particle physics. The development of a novel tomography system based in scintillator detectors at the Jagiellonian University, the J-PET setup [1], with high angular and timing resolutions, allows us to perform multi-disciplinary studies involving fundamental tests of physics, medical research, quantum entanglement measurements [2,3], and enhances our ability to study positronium decays in search of potential Dark Matter candidates, one of the unresolved mysteries of the current SM framework.

We present current searches of Dark Matter (DM) involving ortho-Positronium (o-Ps) decays by means of the J-PET detector. The main aim of this work is to search for Mirror Matter, a new type of matter proposed to restore the parity invariance and plausible candidate for the DM component of the Universe. The study tries to push the actual limits in the precision measurement of the lifetime of the o-Ps decay to three gamma quanta to compare to the accurate QED description in search of the elusive DM [4].

References

- [1] P. Moskal et al. Science Advances, 7:eabh4394, 2021.
- [2] P. Moskal et al. Nature Communications, 12:5658, 2021.
- [3] P. Moskal et al. Nature Communications, 15:78, 2024.
- [4] W. Krzemien, E. Perez del Rio, and K. Kacprzak. Acta Physica Polonica B, 51:165, 01 2020.

Author: MĘDRALA-SOWA , Justyna (Wydział Fizyki, Astronomii i Informatyki Stosowanej, Uniwersytet Jagielloński, Kraków)

Co-authors: Dr PEREZ DEL RIO, Elena (Jagiellonian University); MOSKAL, Pawel (Jagiellonian University)

Presenter: MĘDRALA-SOWA , Justyna (Wydział Fizyki, Astronomii i Informatyki Stosowanej, Uniwersytet Jagielloński, Kraków)

Session Classification: Poster