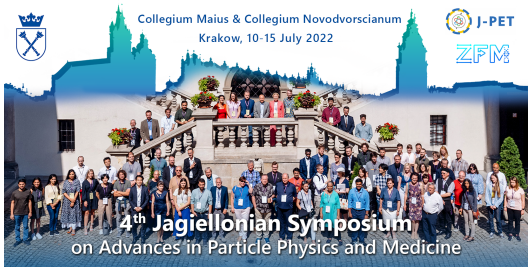

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Invited talk: Development of a spatial sensitive detector for positronium inertial sensing measurements

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Recent experiments have demonstrated the possibility to produce positronium in the long-lived 23S state (lifetime of 1142 ns) via 13S⟶33P [1] laser excitation followed by spontaneous [2, 3] or stimulated [4] 33P⟶23S transition. This excitation scheme has shown to be suitable for the production of a monochromatic source of 23S positronium [3,5].
The employment of such a source of 23S positronium has been proposed to perform the first force-sensitive inertial studies, including gravity, with a purely leptonic system [6]. In order to perform these studies, three main steps are necessary: i) a monochromatic beam of 23S positronium has to be produced, ii) the 23S beam has to cross a deflectometer/interferometer device with consequent formation of the fringe pattern and iii) the displacement of the fringe pattern determined by an external force exerted on positronium has to be detected. In this work, the aforementioned steps are presented. Particular attention will be dedicated to the description of the possible detection schemes that could be used for resolving the fringe pattern displacement. Recent results in the development of a spatial sensitive detector for positronium are shown and the perspectives are discussed.

[1] S. Aghion et al. (AEgIS Collaboration) Phys. Rev. A 94, 012507 (2016)
[2] S. Aghion et al. (AEgIS Collaboration) Phys. Rev. A 98, 013402 (2018)
[3] C. Amsler et al. (AEgIS Collaboration) Phys. Rev. A 99, 033405 (2019)
[4] M. Antonello et al. (AEgIS Collaboration) Phys. Rev. A 100, 063414 (2019)
[5] S. Mariazzi et al. (AEgIS Collaboration) Acta Phys. Pol. A 137, 91 (2020)
[6] S. Mariazzi et al. (AEgIS Collaboration) Europ. Phys. J. D 74, 79 (2020)

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