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Overview of laser-driven positron sources

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The generation of high-quality relativistic positron beams is a central area of research in experimental physics due to their potential relevance in a wide range of scientific and engineering areas, ranging from fundamental science to practical applications. There is now growing interest in developing hybrid machines that will combine plasma-based acceleration techniques with more conventional radio frequency accelerators, in order to minimise the size and cost of these machines.
Moreover, the physics of electron-positron plasmas is attracting renewed interest, due to the presence of this exotic state of matter in a wide range of extreme astrophysical scenarios.
Here we report on recent results obtained by our group in the generation of high-quality positron beams and neutral electron-positron beams [1-5]. After comparing our experimental results with alternative methods proposed in the literature, we will discuss the main physical principles at play and finally propose future experimental directions in this area.

Summary

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