



Contribution ID: 2405 Contribution code: MOPA132

Type: **Poster Presentation**

## Status of hydrodynamic simulations of a tapered plasma lens for optical matching at the ILC e+ source

Monday, 8 May 2023 16:30 (2 hours)

The International Linear Collider is a proposed electron-positron linear collider, where the positron beam is generated by undulator radiation hitting a target. The resulting, highly divergent positron beam requires immediate optical matching to improve the luminosity and ensure the success of the intended collision experiments. Here, optical matching refers to the process of capturing particles and making them available for downstream beamline elements like accelerators. In the past, this has been done with sophisticated coils, but more recently the usage of a current-carrying plasma, a so-called plasma lens, has been proposed as an alternative.

For the International Linear Collider, idealised particle tracking simulations have already been done in the past with the purpose of finding the optimal plasma lens design with respect to the captured positron yield. The proposed design is conical in shape to accommodate for the large beam divergence [1]. Now further research and development of this design is required, including both experiments with a downscaled prototype set-up as well as corresponding simulations modelling the hydrodynamics of the current-carrying plasma. The accuracy of the latter will benefit greatly from the former. In this work, first preliminary hydrodynamic simulations instil confidence into further endeavours.

### Funding Agency

German Federal Ministry of Education and Research [Grant No. 05P21GURB1]

### Footnotes

- 1 M. Formela, K. Flöttmann, N. Hamann, G. Loisch, and G. A. Moortgat-Pick, "Preparation of a Prototype Plasma Lens as an Optical Matching Device for the ILC e+ Source," in Proc. IPAC'22, (Bangkok, Thailand), ser. International Particle Accelerator Conference, JACoW Publishing, Geneva, Switzerland, Jul. 2022, pp. 1961–1963, isbn: 978-3-95-450227-1. doi: 10 . 18429 / JACoW - IPAC2022 - WEPOPT046. <https://jacow.org/IPAC2022/papers/WEPOPT046.pdf>

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**Session Classification:** Monday Poster Session

**Track Classification:** MC1: Colliders and other Particle Physics Accelerators: MC1.T19: Collimation