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Nonlinear plasma lens for achromatic staging: follow-up on latest simulation and experiment

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One core challenge of the SPARTA project [1] is to offer achromatic staging of plasma accelerators to reach high energies. We propose to achieve this through a specific lattice design, made of dipoles in combination with a novel concept: nonlinear active plasma lenses [2]. Originally motivated by an article on the Hall effect in a glow discharge [3], our idea is to shape the plasma lens discharge B-field distribution with an additional external magnet. The device is developed and manufactured at the University of Oslo. Its B-field currently is being characterised at CLEAR test facility, in combination with plasma hydrodynamic simulations in collaboration with DESY.

[1] European Commission, Staging of plasma accelerators for realizing timely applications (2023). URL <https://doi.org/10.3030/101116161>

[2] Drobniak, P., Adli, E., Anderson, H. B., Dyson, A., Mewes, S. M., Sjobak, K. N., ... & Lindstrøm, C. A. (2024). Development of a nonlinear plasma lens for achromatic beam transport. arXiv preprint arXiv:2411.00925.

[3] Kunkel, W. B. (1981). Hall effect in a plasma. American Journal of Physics, 49(8), 733-738.

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