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Plasma-based experiments at the SPARC_LAB test facility

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Plasma-based acceleration has already proved the ability to reach ultra-high accelerating gradients. A significant improvement in the efficiency of particle-driven plasma wakefield acceleration has been demonstrated so far accelerating a witness bunch in the wake of a higher charge driver bunch [1]. Both the transformer ratio and the energy transfer from the driver to the witness beam can be increased by resonantly exciting the plasma with a properly pre-shaped drive electron beam. At present the step towards the realization of a plasma-based accelerator still requires some effort to guarantee high brightness beams, stability and reliability. The transport and focusing of electron beams over cm-scale distances is also worth being investigated and at this regard plasma-based focusing devices will be presented [2].

[1] M. Litos et al., Nature 515, 92-95 (2014).

[2] R. Pompili et al., Appl. Phys. Lett. 110, 104101 (2017).

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