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Generation of hollow driver bunches followed by ultra-high brightness witness for plasma wakefield acceleration

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Plasma-based devices like accelerator modules and lenses for beam optics are of great interest in view of future compact accelerators.

Here we present a detailed study about their implementation at the SPARC_LAB facility in Frascati. In particular, we shape the driver bunch to have a donut-like shape, allowing to preserve the ultra-high brightness of the witness bunch that will be accelerated by the plasma. For this purpose we foresee to use plasma lenses to match the beam into the plasma and to extract it after plasma acceleration.

The aim is to obtain high-brightness plasma-accelerated beams ready to be injected in a Free-Electron Laser.

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