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High quality LWFA: design and implementation at ILIL-PW

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Demonstration of high quality laser-plasma acceleration is mandatory for future development of novel plasma-based radiation sources like the EuPRAXIA H2020 project. In this context we are developing a test electron beam-line based on laser-wakefield acceleration with the aim of driving a Free Electron Laser in the X-ray domain. Our developments include design of a novel injection and acceleration scheme named ReMPI to produce low energy spread, low emittance bunches, and the experimental proof-of-principle demonstration of such a scheme, including a short wavelength injection pulse and a resonant pulse train, all starting from a single Ti:Sa laser pulse. These developments take advantage of the recent upgrade of the ILIL-PW facility including the recent >100 TW scale laser upgrade and the commissioning of the new, PW scale interaction area. A preliminary set of data was already acquired following the successful commissioning of the laser system. Data include output from a range of diagnostics designed to characterize gas target, laser-gas interaction stability and electron bunch characterization. An overview of the preliminary results will be given along with a description of the full design and the relevant upgraded ILIL-PW facility and features.

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