

# The Plasma Injector for PETRA IV: Conceptual Design Report

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We present the conceptual design of an alternative injector system based on laser-plasma accelerator technology, to deliver high-quality electron bunches to PETRA IV –the future 4th generation synchrotron light source at DESY. The design consists of a laser-plasma accelerator to produce electron bunches at 6 GeV with state-of-the-art energy spread and stability, and a X-band energy compressor beamline to further reduce the overall beam energy deviations and maximize the charge injection throughput into the PETRA IV storage ring. Driven by the Petawatt upgrade of DESY's new flagship laser KALDERA, the plasma injector system can be used to top up the PETRA IV storage ring, significantly lowering the load on the conventional injector chain. Ultimately, upon further development of high-efficiency, high-power laser drivers that operate at high repetition rates, the plasma injector could potentially replace the conventional system in the future and dramatically reduce the spatial footprint and energetic cost of the whole injector complex.

**Primary author:** MARTINEZ DE LA OSSA, Alberto (DESY)

**Co-authors:** MAIER, Andreas (DESY); FERRAN POUSSA, Angel (DESY); AGAPOV, Ilya (DESY); OSTERHOFF, Jens (DESY); KIRCHEN, Manuel (DESY); THEVENET, Maxence (DESY); WINKLER, Paul (DESY); BRINKMANN, Reinhard (DESY); Dr SHALLOO, Rob (DESY); ANTIPOV, Sergey (DESY); JALAS, Sören (DESY); LEEMANS, Wim (DESY)

**Presenters:** MARTINEZ DE LA OSSA, Alberto (DESY); THEVENET, Maxence (DESY)

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