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EARLI: design of a laser wakefield accelerator for AWAKE

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Following the successful Run 1 experiment, AWAKE has developed a program for Run2 that requires designing and implementing a compact electron source (150 MeV, ≥ 100 pC) for external injection. The baseline design uses a S- and X-band RF photo-injector gun system. The project EARLI investigates the feasibility of an alternative electron source system using a laser wakefield accelerator (LWFA) to produce this electron bunch. Currently, the EARLI project is in the design phase backed by the preparation of experimental demonstrations to prove the feasibility of this accelerator. The main originality of the chosen approach is that the focus is made exclusively on the final beam-targeted characteristics and the reliability and repeatability of the beam quality. EARLI is a stand-alone injector that consists of three main parts: a laser system, a plasma cell and a transfer line, at the end of which the electron beam is injected in a plasma wave driven by a self-modulated proton bunch. Methods from conventional accelerators are applied to LWFA physics. Each part requires specific expertise, that must be investigated in close coupling with the others. A massive campaign of simulations and optimizations with PIC codes is ongoing while the design of the transfer line, the plasma chamber, diagnostics and the laser are carried out in parallel.

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Footnotes

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Yes

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