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Radial Equilibrium of ultrarelativistic particle beams in plasma wakefield accelerators

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AWAKE experiment on proton driven plasma wakefield acceleration in CERN presents a real challenge for numerical simulations. Parameters of the experiment fall far beyond the area for which most codes were originally developed and tuned. Proton beams are very long, a few hundred plasma wavelengths. The excited wakefield is a result of an instability and depends on small amplitude seed perturbations. At the same time, the design of the experiment relies mainly on simulation results rather than on other experiments. Therefore, it is important to provide a thorough validation of available codes with test problems that contain the main physical effects involved. In this report, we describe several AWAKE-related tests used for crosschecking computer codes and discuss which aspects are particularly important for quantitatively correct simulations of AWAKE physics.

Primary author: Prof. LOTOV, Konstantin (Novosibirsk State University)

Presenter: Prof. LOTOV, Konstantin (Novosibirsk State University)

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