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Mechanical and thermal stress on a pulsed solenoid for positron capture at the ILC undulator-based positron source

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The performance of positron source in the International Linear Collider (ILC) is critical for the luminosity and therefore the physics output of this planned, future high energy physics machine. In the undulator-based source proposed for the ILC, positrons are produced by generation of electron-positron pairs by an incident high energy photon on a high-Z target material. The amount of positron that can be transported downstream the adjacent accelerator section and finally the interaction point is to a large extent defined by the so-called optical matching device. This beam-optics element matches the phase space of the high-divergence, large-energy-spread positron beam into the acceptance of the accelerating section beam optics. As conventional matching devices like the quarter-wave transformer do not fulfill the stringent requirements of the ILC, a pulsed solenoid was proposed and shown in simulation to outperform other proposed devices. In this contribution we discuss the current status of this pulsed solenoid with respect to positron capture efficiency, cooling, mechanical stability, and other critical performance aspects.

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