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Long pulse electron accelerator GESA-SOFIE: A numerical study of the beam characteristics

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The new electron accelerator GESA-SOFIE for long pulse operation was specially designed for in-situ diagnostics and investigation of the beam characteristics and operation performance under different conditions. One of the new features is the possibility to tune the shape and position of the electrodes. The use of a planar cathode necessary to optimize the diagnostics, for instance, makes an optimum alignment of electric and magnetic fields in the region of beam generation impossible. The specific requirements on the geometry pose a new challenge on the design optimization. Further, different impedance regimes are of interest for the diagnostics and characterization. In this presentation, a numerical study of the beam performance of GESA-SOFIE under different conditions is conducted using the PIC code simulation package MAGIC3d. The geometry of various components of the facility as well as the coil currents are modified. The external magnetic field is calculated, taking into account the induced eddy currents, in a fully 3-dimensional time dependent study using the FEM code COMSOL Multiphysics. The B-field results serve as input for the PIC simulations of the beam characteristics. The numerical results of the GESA-SOFIE beam performance are compared with respective experimental data.

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