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Electron Cloud Simulations for the FCC-ee

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In high-energy particle accelerators, electron clouds may occur due to high synchrotron radiation-related photoemissions, residual gas ionization, and secondary emissions during positively charged beam circulations in the vacuum chambers. The electron cloud formation could cause beam losses, trajectory changes, and wakefields. This study presents electron cloud build-up investigations for different scenarios in the scope of FCC-ee damping and collider ring machines and beam parameters. We employ two-dimensional electrostatic particle-in-cell simulations where the effects of space charge, secondary, and photoelectrons are included. Furman-Pivi and ECLOUD secondary emission yield models are applied for the numerical experiments. The electron density at the center of the beam pipe for various bunch spacings, secondary emission yield, and photoemission yield parameters are studied. We obtained reference electron cloud level and neutralization densities.

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