

Title: Preliminary Design of the Photon Dump for the CEPC

Abstract:

During the operation of the Circular Electron Positron Collider (CEPC), the Beamstrahlung process generates a significant number of high-energy photons, particularly in the Higgs operation mode, where the photon power can reach up to 500 kW. This poses a challenge to maintaining safe radiation levels around the accelerator.

This study presents the initial design of a photon dump, an innovative absorber specifically developed to capture these Beamstrahlung photons and reduce the surrounding dose rate to below 5.5 mSv/h. The design process focuses on selecting suitable materials, optimizing geometric configurations, and determining effective placement strategies to maximize photon absorption and minimize radiation leakage.

Future work will utilize multi-objective intelligent optimization algorithms to further refine the design parameters, balancing factors such as absorption efficiency, material cost, and structural constraints to achieve the most effective solution. This preliminary design aims to ensure safety and enhance the operational performance of the CEPC accelerator in its Higgs mode of operation.

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