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Radiation load studies for the FCC-ee positron source with a superconducting matching device

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For an electron-positron collider like FCC-ee, the production of positrons plays a crucial role. One of the design options considered for the FCC-ee positron source employs a superconducting solenoid made of HTS coils as an adiabatic matching device. A superconducting solenoid yields a higher peak field than a conventional flux concentrator, therefore increasing the achievable positron yield. Furthermore, in order to achieve an acceptable positron production, the considered target is made of tungsten-rhenium. However, superconducting coils exhibit a higher sensitivity to the radiation load. In this study, we assess the feasibility of such a positron source by studying the heat load and long-term radiation damage in the superconducting matching device and surrounding structures. Results are presented for different geometric configurations of the superconducting matching device, considering different shielding geometries and target positions.

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