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Beam dynamics study of the high-power electron beam irradiator using niobium-tin superconducting cavity

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At KEK a design of the compact 10 MeV, 50 mA accelerator for irradiation purpose was proposed. Current design includes a 100 kV thermionic DC electron gun with an RF grid, 1-cell normal-conducting buncher cavity, and Nb3Sn superconducting cavities to accelerate the beam to the final energy of 10 MeV. The goal of the present beam dynamics study is the beam loss suppression (to the ppm level), since it results in a thermal load on the cavity. Then the beam performance at the accelerator exit should be confirmed. The main issue was to transport the beam without loss, since the initial electron energy (100 keV) is low, and the beam parameters are intricately correlated. In addition, the space charge effect is considerable. For this reason, simultaneous optimization of multiple parameters was necessary. Here we report optimization results and their effect on the design of the machine.

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Footnotes

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Yes

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