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连续波模式下超导加速器束流负载分析研究

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摘要 本工作推导了超导加速器在连续波模式时,在点电荷近似条件下,相对论束流负载与腔的相互作用过程的解析表达。同时对北京大学超导加速器平台(PKU SCAF)的束流负载设计进行了初步分析。计算结果表明,当主加速器馈入功率为10kW时,最佳束流负载为1 5mA,此时电子增能为6 6MeV,β因子为4 5×103。

关键词 超导加速器 连续波 腔束相互作用

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Research on the Beam Loading in the CW Superconducting Accelerator

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Abstract The superconducting(SC) accelerator has high quality factor Q , and the decay time of the field excited by beam is much longer than that in normal conducting cavity. Thus, beam induced field has far consequences for power dissipation and beam stability. In the paper, this interaction process is analyzed considering a point charge moving on axis through a cavity. Based on it, the beam loading in PKU SCAF has been researched. With the 10 kW input power, the optimal average current in the 9 cell SC cavity of PKU SCAF is 1.5 mA, accelerating voltage is 6.6 MV, and β factor is 4.5×10 3.

Key words superconducting accelerator continuous wave interaction between the cavity and the beam

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通讯作者