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非极端相对论的阻抗壁尾场计算

摘要

非相对论尾场函数理论不仅适用于质子或重离子加速器，而且随着新的加速器物理理论的出现，人们发现它同样适用于诸如稳态微聚束（SSMB）储存环之类的电子加速器。然而，现有的研究成果距离实际应用仍有很大差距。在本文中，我们在前人工作的基础上，进一步将之前的点源模型推广为更具普遍性的环模型。当考虑非相对论极限情况时，我们发现了一种全新的最低阶横向尾场，并估计在某些情况下其强度可与偶极场相当。此外，通过分离空间电荷分量，我们提出了一种能够更高效计算电阻壁场的数值算法。最后，作为简单应用，我们利用稳态微聚束（SSMB）的参数计算了寄生损耗和踢角。

关键词

阻抗壁尾场非极端相对论

Abstract

The Non-Ultrarelativistic Wake Function theory is not only applicable to proton or heavy ion accelerators. But with the emergence of new accelerator physics, it has been found to be equally applicable to electron accelerators such as the Steady State Micro Bunching (SSMB) storage rings.
However, existing results are still far from practical applications. In this paper, building on previous work, we further generalize the previous point source model into a more universal ring model.
When considering the non-ultrarelativistic limit, we discover a completely new lowest-order transverse wake field and estimate its intensity to be comparable to the dipole field on certain circumstance.
Moreover, by separating the space charge component, we propose a numerical algorithm that can compute the Resistive Wall field more efficiently.
Finally, we calculate the Parasitic Loss and Kick Angle using SSMB's parameters as simple applications.

Keywords

resistive wall, wakefield, non-ultrarelativistic

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