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Extreme radiation from electron beams in ion channels and undulators

Tuesday 3 June 2025 16:00 (2 hours)

We compare radiation from relativistic electrons ($\gamma \gg 1$) in magnetic undulators and ion channel betatron oscillations, addressing limitations in conventional theories for high undulator parameter (K) and K/γ regimes. Differences in magnetostatic and electrostatic oscillations lead to inaccurate trajectory and radiation descriptions. By reformulating key parameters, we enable comparisons of equivalent oscillation conditions and analyze distinct spectral features via numerical simulations. A novel transverse orbit precession effect in ion channels, significant for particles with initial angular momentum, is identified and shown to impact radiation divergence and beam emittance. Theoretical predictions are validated through simulations, providing insights for experimental applications.

Footnotes

Paper preparation format

LaTeX

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America

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