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3D theory of short-wavelength instabilities driven by space-charge

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Microbunching - or short-wavelength -instabilities are well-known for drastic reduction of the beam quality, its filamentation and strong amplification of the noise in a beam. Space charge and coherent synchrotron radiation (CSR) are the leading causes for such instability. In this paper we present rigorous 3D theory of such instabilities driven by the space-charge forces. We define the condition when our theory is applicable for an arbitrary accelerator system with 3D coupling. Finally, we derive a linear integral equation describing such instability and identify conditions it can be reduced to an ordinary second order differential equation

Footnotes

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