

Abstract Submitted
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Investigation of the Coherent Synchrotron Radiation Instability¹

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Cornell University — The emission of coherent synchrotron radiation (CSR) is undesirable for the operation of bunch compressors needed to inject low emittance beams into a linear collider. On the other hand CSR may help to understand the high brightness temperature and the observed spectra emitted by radio pulsars. Analytical results obtained from solving the Vlasov-Maxwell equations for a collisionless, relativistic, finite-strength, cylindrical layer of charged particles in free space are compared to similar results obtained from MHD. We emphasize the effect of the betatron oscillations in layers with non-zero thickness which lead to a significant decoherence and a characteristic spectrum which is similar to the observed spectra of radio pulsars. The particle-in-cell code OOPIC has been used to verify some aspects of our model including the scaling of the growth rates and the emitted power as a function of Lorentz factor, number density and energy spread. The relation of the CSR instability with other instabilities will be discussed briefly.

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