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Edge Electron Heatings by the nonlinear Landau damping[1] JOHN R. CARY, University of Colorado and Tech-X Corporation, NONG XIANG, University of Colorado — To heat an over-dense plasma, for which the electron plasma frequency is a couple of times of the electron gyro-frequency, it has been proposed that the incident electromagnetic wave can be converted into an electron Bernstein waves (EBW) which does not have a cutoff in plasma, and the EBW will be absorbed at the electron cyclotron resonance in the plasma. In this work, the PIC simulations are conducted to study the nonlinear wave processes near the plasma edge. It is shown that if the incident frequency is larger than the second harmonic electron cyclotron frequency near the upper hybrid resonance (UHR), the incident wave may decay to an electron cyclotron wave whose frequency equals the electron gyro-frequency near the UHR, and an EBW at a lower frequency. As a result, a significant portion of the incident wave power will be absorbed at the plasma edge and electrons are strongly heated. This nonlinear Landau damping could much reduce the electron heating efficiency in the core plasma, and significantly affect the edge plasma properties.

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