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Parametric study of the formation of electron flat-top distributions driven by ion beams

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Electron flat-top distributions have been observed in various regions in space, such as Earth's bow shock, Earth's magnetotail, and solar wind. It has been suggested that potential wall across the shock layer or some wave structures can produce the electron flat-top distributions. In this study we report the formation of the electron flat-top distributions by ion beam driven instabilities using 1D PIC simulations. The ion beam driven instabilities quasi-periodically form phase space holes, which are fully dissipated resulting in heated, isotropic flat-top distributions. We parametrically investigate the development of electron phase space distributions for various drift speeds of ion beams and temperature ratios between electrons and ions. These results will be compared with the observations of the flat-top distributions in space. Also, we will discuss the physical implication of the formation of the flat-top distributions for the equilibrium of a plasma system.