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Modeling of two-electron temperature plasma expansion into vacuum

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A theoretical model is developed to describe self-similar plasma expansion into vacuum with two electron temperature distribution function. The cold electrons are modeled with a Maxwellian distribution while the hot ones are supposed to be nonthermal obeying a kappa distribution function. It is shown that ion density and velocity profiles depend only on cold electrons in early stage of expansion whereas ion acceleration is strongly enhanced with the proportion of kappa distributed electrons at the ion front. It is also found that when the kappa index is decreasing, the critical value of temperature ratio T_{eh}/T_{ec} , limiting the application of quasi-neutrality, becomes larger than the value obtained in the two electron Maxwellian Bezzerrides model [1].

[1]: B. Bezzerrides, D. W. Forslund, and E. L. Lindman, *Phys. Fluids* 21, 2179 (1978)

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