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A simulation approach of high-frequency electrostatic waves found in Saturn's magnetosphere

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Using a particle-in-cell (PIC) simulation, the characteristics of electron plasma and electron-acoustic waves are investigated in plasmas containing an ion and two electron components. The electron velocities are modeled by a combination of two κ distributions. The model applies to the extended plasma sheet region in Saturn's magnetosphere where the cool and hot electron velocities are found to have low indices, $\kappa_c \approx 2$ and $\kappa_h \approx 4$. For such low values of κ_c and κ_h, the electron plasma and electron-acoustic waves are coupled. The model predicts large amplitude electron plasma waves while electron-acoustic waves may need a source of free energy to drive the mode unstable.