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Fast ion-acoustic soliton stopbands in plasmas with two-temperature kappa-distributed electrons

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The existence of stopbands, which are ranges in speed where solitons
cannot propagate was proposed for the very first time in a study of fast ion-acoustic solitons by Nsengiyumva et al. [1] for a plasma composed of cold ions, warm (adiabatic) ions and Boltzmann electrons. We recall that the stopbands arise when the warm ion limiting curve is double-valued in speed over a range of normalised cold ion density values. The current study is a theoretical investigation of stopbands in a plasma with cold ions, warm (adiabatic) ions and two-temperature kappa-distributed electrons, having spectral indices kappa;_c and kappa;_h. The stopbands are found to widen for decreasing values of kappa;_c (kappa;_h is fixed) or kappa;_h (kappa;_c is fixed), until the warm ion limiting curve bifurcates into an upper and lower branch. The stopbands disappear when the warm ion limiting curve becomes single-valued over the range of cold ion densities for very low values of the spectral index, when the proportion of superthermal electrons is significant. The considered plasma model may be applied to the magnetosphere of Saturn [2] where two-temperature electron populations which follow kappa distributions exist.

[1] F. Nsengiyumva, M. A. Hellberg, F. Verheest, and R. L. Mace,
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[2] P. Schippers, M. Blanc, N. Andreacute;, I. Dandouras, G. R. Lewis, L. K. Gilbert, A. M. Persoon, N. Krupp, D. A. Gurnett, A. J. Coates, S. M. Krimigis, D. T. Young, and M. K. Dougherty,
J. Geophys. Res. 113, A07208,
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Apply to be
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No

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N/A

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