

Stopbands In The Existence Domains Of Acoustic Solitons

F. Nsengiyumva¹, M.A. Hellberg¹, F. Verheest^{1,2} and R.L. Mace¹

¹*School of Chemistry and Physics, University of KwaZulu-Natal, Durban, 4000, South Africa*

²*Sterrenkundig Observatorium, Universiteit Gent, B-9000, Belgium*

A fully nonlinear Sagdeev pseudopotential approach is used to study the existence domains of fast mode ion-acoustic solitons in a three-species plasma composed of cold and warm adiabatic positive ion species and Boltzmann electrons.

We report a novel finding, namely, the existence of a stopband in soliton speed over a range of values of the cold-to-warm ion density ratio, f , for a window in the parameter space of μ (the warm-to-cold ion mass ratio) and τ (the warm ion to electron temperature ratio). For the appropriate range of f , solitons do not propagate within the range of soliton speeds defined by the stopband, although they are supported for both higher and lower speeds. The stopbands are associated with a limiting curve of the existence domain that is double-valued in speed for a range of values of f . We believe that such stopbands have not been reported before.