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Parametric excitation of an electrostatic wave in a nonuniform relativistic warm plasma waveguide

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Abstract
The propagation of an electrostatic wave in a nonuniform relativistic warm plasma waveguide under the effect of HF electric field is investigated. A new mathematical technique "separation method" applied to the two-fluid plasma model to separate the equations, which describe the system, into two parts time and space parts. An analytical study of the reflection of electrostatic wave propagation along a magnetized nonuniform relativistic warm plasma slab subjected to an intense HF electric field is presented and compared with the non relativistic cold plasma case. It is found that when the frequency of the incident wave ω_g is close to the relativistic warm electron plasma frequency ωp_g, the plasma is less reflective due to presence of the HF field and the effect of relativistic warm electrons. On the other hand, for a low-frequency incident wave (ω_g ~ ω_{pi}) the reflection coefficient is directly proportional to the amplitude of the HF field. Also, it is shown that the relativistic warm electrons plasma lead to a decrease of the value of the reflection coefficient in comparison with the case of non relativistic cold plasma.

Author Keywords
Propagation of electrostatic wave; Relativistic warm plasma waveguide; Separation method; The reflection coefficient