

# Interpretation of filamentation of intense electromagnetic waves in inhomogeneous plasma: relativistic nonlinearity

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## **Abstract**

A relativistically intense electromagnetic wave propagating through inhomogeneous plasma is susceptible to filamentation instability. The nonlinearity responsible for this instability arises through the relativistic oscillation of the mass of electrons in the field of the pump wave. When the equilibrium is perturbed by a electromagnetic perturbation, a further reduction in the plasma frequency occurs in the regions of high field intensity due to the relativistic mass increase of the electrons in presence of the pump wave and perturbation. For a linear density profile the amplitude of the filament varies with  $z$  as an Airy's function. Growth rate increases with the transverse wave vector of the perturbation.