Amplification of a Wake Field Generated by a Charged Bunch in a Resonant Medium

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A bunch of electrons moving in an active medium excites a wake that is amplified by the medium. The intense radiation field generated in this process reduces the population inversion and, as a result, the field-medium interaction reaches saturation. We show that the accelerating gradient at saturation may reach the 1 GV/m level before the medium is ionized. When ionization occurs, higher gradients may develop provided that we excite resonant sates of a partially stripped atom.

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