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Relativistic effect of ponderomotive force direction reversal in a standing laser wave ALEXANDER KAPLAN, ALEXANDER POKROVSKY, ECE Department, Johns Hopkins University — In our research, we theoretically discovered a relativistic effect of the direction reversal of the field-gradient (ponderomotive) force (PF) in a standing laser wave. This reversal makes the high-field areas attractive for electrons, in contrast to the regular PF, and it represents the only effect known so far that pins down a distinct borderline between relativistic and nonrelativistic motion. We demonstrated that the collinear configuration, in which the laser wave is linearly polarized with electric field, $\vec{E}$ parallel to the initial electron momentum, $\vec{p}_0$, is the optimal configuration for the relativistic reversal. In that case, the transverse PF reverses its direction when the incident momentum is $p_0 = mc$. The reversal effect vanishes in the cases of circular and linear with $\vec{E} \perp \vec{p}_0$ polarizations. We have discovered, however, that the counter-rotating circularly polarized standing waves develop attraction and repulsion areas along the axis of laser, in the laser field whose intensity is homogeneous in that axis, i.e. has no field gradient.

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