

Abstract Submitted  
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**Ponderomotive Acceleration by Relativistic Waves**<sup>1</sup> CALVIN LAU, PO-CHUN YEH, ONNIE LUK, JOSEPH MCCLENAGHAN, Dept. of Physics and Astronomy, University of California, Irvine, CA, TOSHIKAZU EBISUZAKI, RIKEN, Wako, Saitama, Japan, TOSHIKI TAJIMA, Dept. of Physics and Astronomy, University of California, Irvine, CA — In the extreme high intensity regime of electromagnetic (EM) waves in plasma, the acceleration process is found to be dominated by the ponderomotive acceleration (PA). While the wakefields driven by the ponderomotive force of the relativistic intensity EM waves are important, they may be overtaken by the PA itself in the extreme high intensity regime when the dimensionless vector potential  $a_0$  of the EM waves far exceeds unity. The energy gain by this regime (in 1D) is shown to be (approximately) proportional to  $a_0^2$ . Before reaching this extreme regime, the coexistence of the PA and the wakefield acceleration (WA) is observed where the wave structures driven by the wakefields show the phenomenon of multiple and folded wave-breakings. Investigated are various signatures of the acceleration processes such as the dependence on the mass ratio for the energy gain as well as the energy spectral features. The relevance to high energy cosmic ray acceleration and to the relativistic laser acceleration is considered.

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