Numerical study of Direct Laser Acceleration in the Bubble Regime\textsuperscript{1} XI ZHANG, VLADIMIR KHUDIK, Department of Physics, The University of Texas at Austin, SUNGHWAN YI, Los Alamos National Laboratory, GENNADY SHVETS, Department of Physics, The University of Texas at Austin — Direct Laser Acceleration (DLA) is an acceleration mechanism \cite{1} that combines the traditional plasma wakefield acceleration inside the plasma bubble with direct energy gain from the laser pulse. Recent experiments \cite{2} demonstrated an indirect signature of the DLA: highly efficient gamma-rays from resonantly excited betatron oscillations of accelerated electrons inside the plasma bubble. We will discuss our numerical modeling of the DLA (Direct Laser Acceleration) using the 3D VLPL code \cite{3}. It is demonstrated that plasma electrons are self-injected into the expanding plasma bubble \cite{4} and eventually catch up with the bubble-generating laser pulse. The energy is then directly transferred from the laser pulse to the electrons provided that the Doppler-shifted laser frequency coincides with that of the betatron oscillations. A simple analytic theory of the DLA is developed and the prospects for achieving high-energy gammas at the Texas Petawatt laser are discussed.

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\begin{thebibliography}{9}
  
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  \bibitem{2} S. Cipiccia et al., Nature Phys. 7, 867-871 (2011).
  \bibitem{3} A. Pukhov, J. Plasma Phys. 61, 425-433 (1999).
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