Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Particle acceleration in relativistic unmagnetized collisionless plasma shocks: the emergence of Fermi Acceleration and energy bifurcation ROOPENDRA S. RAJAWAT, School of Applied and Engineering Physics, Cornell University, Ithaca, Ny 14850, USA, V. KHUDIK, Department of Physics and Institute for Fusion Studies, The University of Texas at Austin, Austin, TX 78712, USA, G. SHVETS, School of Applied and Engineering Physics, Cornell University, Ithaca, Ny 14850, USA — We numerically study collisionless shocks generated by two colliding electron-positron plasma shells by using 2D first principle PIC code. Shocks are mediated by Weibel instability (WI), and initial kinetic energy (KE) of particles $mc^2\gamma_0$ changes via WI induced electric fields. We have found two groups of particles: having moderate ($\gamma \sim \gamma_0$) and large kinetic energies ($\gamma >> \gamma_0$). To get insight of the acceleration/deceleration mechanism, KE of the particles in these groups has been decomposed into the works done by the transverse and longitudinal electric fields. It is found that in the first group the KE takes equal contribution from both components of the electric field, while in the second group the KE takes most of the energy from the transverse electric field: the ratio of work done by the transverse and longitudinal electric field is found out to be ~ 5. The position of the separation point between these two groups is found to be $\gamma/\gamma_0 \sim 2$. An analytical model has been developed to explain the work decomposition and separation point.

Roopendra Singh Rajawat
Institute for Plasma Research

Date submitted: 03 Jul 2019 Electronic form version 1.4