Contribution ID: **7** Type: **Invited Speaker**

Ion Acceleration in Driven Magnetic Reconnection During High-energy–density Plasma Interaction

Strongly driven magnetic reconnection occurs in astrophysical events and also in laboratory experiments with laser-produced plasma. We have performed 2.5D particle-in-cell simulations of collisions of two high-energy–density plasmas resulting in strongly driven magnetic reconnection that demonstrates significant non-thermal ion
acceleration. Such acceleration is significant only when the plasma beta is sufficiently low that the Alfvén speed at the reconnection inflow exceeds the thermal speed. Under these conditions, the most energetic ions are primarily
accelerated by the Hall electric field in the reconnection outflow, especially at the trailing edge of an emerging plasmoid in the outflow. Laboratory experiments in the near future should be able to confirm these predictions and their applicability to astrophysical situations. Partially supported by grant RTA6280002 from Thailand Science Research and Innovation.

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Track Classification: Ion and Plasma Physics