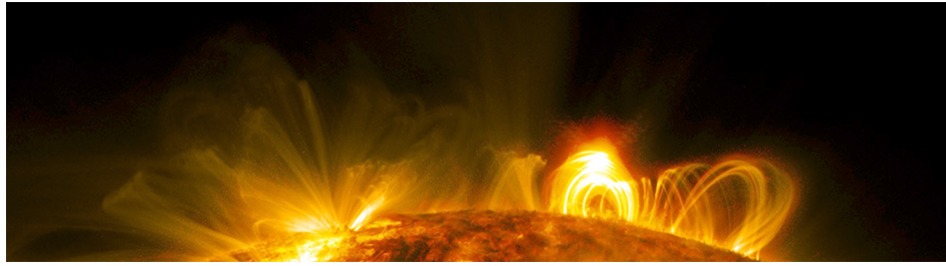


# Particle Acceleration in Solar Flares and the Plasma Universe – Deciphering its features under magnetic reconnection



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## Principal Acceleration Process for High-Energy Particle Event

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The physical links between CMEs and solar storms were well understood, but the CMEs were not still confirmed for particle acceleration at the Sun. It was observed that CME associated shocks accelerate particles in the interplanetary (IP) space, but it was not understood at what distance from the Sun such acceleration becomes important. Although m-type II bursts, indicative of MHD shocks low in the corona, are clearly associated with the majority SEP events, such shocks were not found ahead of CMEs. Some researchers found that the speeds deduced from the drift rates of m-type II bursts have differed greatly from the speeds of accompanying CMEs, thus suggesting that the m-type II bursts are not caused by shocks driven by CMEs. The m-type bursts are most likely caused by flares, not by CMEs. Recently, we investigated that the flare initial onset is always earlier than the CME initial onset and suggested that the flare is probably the main reason of the high energy particle events. When we assumed the particle onset at nearly 1 au, it was found that the high energy particle event onset is close to the onsets of the flare components and obviously if we consider the particles are not scatter free and trace nearly close to the Sun, the flare appears to be the principal acceleration that causes high-energy particle events (MeV; GeV). Current space missions, such as Solar Orbiter and Parker Solar Probe located in the inner heliosphere, will surely shed more light into this topic.

**Primary author:** KAZI MD ABUL, Firoz (Independent)

**Co-authors:** GAN, W.Q.; RODRIGUEZ-PACHECO, J; LI, Y. P.

**Presenter:** KAZI MD ABUL, Firoz (Independent)

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